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Editorials.

THE POSITION OF VETERINARY HYGIENE IN THE COLLEGE CURRICULUM.

THERE seems to be a general feeling among many teachers and thinkers in the Profession that the time has arrived for a little reorganisation of the order in which the subjects should be taken for study and examination, and a number of articles which have appeared during the past few months in our columns have ventilated the matter.

The times advance and we must advance with them; and the difficulty at the present day, in considering the education of any of the professions, is to be able to cover the ground of educational subjects in anything like a reasonable space of time.

Our curriculum is now spread over four consecutive years, and the number of our subjects, each of which is a special thing in itself, has increased to more than double what it was in the times of our fathers.

Thoroughness and efficiency in every branch which is taken up are absolute essentials at the present day, and it is of no use to acquire merely a superficial knowledge of this or that subject. If some method could be devised whereby any closely allied subjects could be taken together and rolled into one, it would at all events do away with the necessity of going over the same ground twice.

Stable Management and Hygiene are illustrations of two subjects so closely allied that they could very well be taught together, as the ground over which the students are taken in the former case is again taken when dealing with the latter. Hygiene, the study of the animals in health, must of necessity include stable management and the principles of normal shoeing. No College has established a special chair for stable management alone, and the time which is given to it in the second year might with much greater benefit be devoted to something else. Certainly

when a student has reached that stage in his career it is high time that he knew something about the management of animals in health, especially if it is his intention to become a practising veterinary surgeon. The subject of Veterinary Hygiene could not come at too early a stage in the career of the student and it would relieve the dulness and drudgery of the first year's work, besides introducing him to the practical part of his career, if Hygiene were taken here.

The greater part of Veterinary Botany could conscientiously be brought within its folds, as the main object of the botanical teaching is to learn the names and characteristics of the forage and food plants. A student who has acquired sufficient knowledge to pass an examination in veterinary hygiene in his first year at College, would certainly know something about animals in health and would be valued as a pupil in any practice in which he might go.

After a course of Veterinary Hygiene a man who has the good sense to spend his holidays in gaining an insight into the work which he intends to practise eventually (and it is with regret that we have to say that very many prefer to slack away the vacation in doing nothing, instead of seeing practice), would be of use to himself and to his employers.

At the present day very few practitioners will take a student from College unless they are well paid. They know that unless he has been amongst animals and learned how to go about them, he is an encumbrance and an anxiety rather than a help, and may even, (as their responsible representative), land them into legal expenses. Let Veterinary Hygiene, then, be placed as far forward as possible in the College curriculum, as it is undoubtedly *the foundation* of the future edifice of pathological knowledge, for it is foolish of a man to endeavour to study disease until he has first understood what is meant by health.

The views expressed by Professor Craig in last month's number, in reference to Stable Management are very sound, and it will undoubtedly improve the students' practical knowledge and future chances if he begins by being thoroughly grounded, right at the commencement of his career, in the principles of health and the habits of animals in that condition. Personally, we think it a great mistake that a pupilage of some kind is not enforced and that it is not compulsory to produce a certificate to say that one has passed at least twelve months amongst animals, under the direction of some competent teachers, either veterinary or agricultural, before the diploma is granted.

What should we think of a doctor of human medicine, who was given his diploma without having ever been allowed to be in contact with his future patients and learn their habits in health? It is only by knowing the normal that we can gain any idea of what is abnormal, and the only way to gain that knowledge is to be in constant contact for a prolonged period of time with our future patients.

We also think that it would be of the greatest advantage to the

College student if more attention was paid to the names and characteristics of the different breeds, not only of horses, but of cattle, dogs, sheep, pigs, and even birds.

In a town practice a young graduate often becomes an object of pity in the eyes of the breeder of dogs, because he will persist in speaking of, perhaps, a "Schipperke" as a "black terrier," or a "Griffon" as a "toy Irishman," &c.; and in the country it is quite time that the newly-fledged veterinary surgeon should be able to tell the difference, without being prompted, between a Shorthorn and a Hereford cow, or a Tamworth pig and a Berkshire.

To be able to talk to a client in matters of this kind is half the tact of practice, and wins confidence at once; it is one of the characteristics of the truly practical man. In fact, it seems absurd to the members of the general public that a man should be given his diploma without having acquired this rudimentary knowledge.

VETERINARY INSPECTION OF OUR FOOD SUPPLY.

In continuation of a series of articles on this very important question, we draw our readers' attention to some remarks in our columns from the pen of Mr. Alfred Holburn, M.R.C.V.S., the chief veterinary inspector for the food supply of one of our most densely populated cities—Manchester. It is not, indeed, pleasant reading, to say the least of it, that our foods are adulterated to the extent of $8\frac{1}{2}$ per cent., and our milk 11 per cent., and it is well worth while to ponder over his suggestion that the accumulation of small quantities of adulterations in each foodstuff partaken of at each meal may, when added together, readily be understood, without much imagination, to produce an aggregate amount which will, if persistently taken, give rise to digestive troubles. We have no need to go to Chicago to look for remediable faults in our food supply!

VETERINARY EDUCATION AND EXAMINATIONS.

BY G. H. WOOLDRIDGE, F.R.C.V.S., PROFESSOR IN THE ROYAL VETERINARY COLLEGE, DUBLIN

In a previous issue of this journal I wrote on the above subject under the *nom-de-plume* of "A Teacher," in reply to an article by "Syntax," and in the course of my contribution I ventured to suggest that the opinion of practitioners would be valuable on such an important matter. They do not appear, however, to be very much interested, judging by the results of the invitation of the Editor to join in the discussion. Are they really "lukewarm" in educational matters since obtaining their own diplomas, or is their silence due to pressure of work? I certainly hope the latter, but I very much doubt it.

We had certain aspects of this question under discussion at a recent meeting of the Veterinary Medical Association of Ireland so far as examinations are concerned, and I believe I am interpreting the general feeling correctly when I say that nearly all the members were of opinion that the present system, although perhaps not perfect, is much more free from serious objections than would be the case if teachers were introduced into the examining board. That position, which is the one I took up in my previous contribution, I still maintain, and hold all the more firmly when bearing in mind the additional experience and results of the recent (July) examinations of the R.C.V.S. Again, speaking of the final exams, the results are almost identical with what the teachers expected with regard to order of merit, and curiously enough the highest and second marks in medicine were awarded by the external examiners to the winners of the first and second medals respectively (the awards being made on results of monthly class examinations), the same also applying to surgery. Nor must it be imagined that these men stood out so far above the others; only a few marks divided them, and, moreover, the student who was first in medicine was second in surgery, and *vice-versa*. In the last issue "M" supports most if not all my contentions, but makes an additional suggestion with reference to stable management, which he would have made a preliminary subject. I am inclined to agree with him, if it could be made practicable, and that is a point on which I dwelt last year at the annual meeting of the National Veterinary Association. Of course, to carry such a suggestion into effect, a compulsory pupilage would be necessary, and as an additional fee might be charged for students wishing to register as veterinary students, as the result of such an examination the coffers of the R.C.V.S. would reap a decided advantage. It certainly is hard lines, in a way, when a student obtains honours marks in Anatomy and in Physiology and yet fails, and often deservedly so, in stable management. One possible solution to the latter apparent hardship has been suggested, viz:—to allow such a student to proceed to his third year's work, but again present himself for stable management at the ensuing examination.

There is one great step possible, however, which would open the way to the best solution of the question, but unfortunately I see very little sign of it being accomplished. I mean the taking over by the State of the various teaching institutions, and making this important branch of education a national concern. Then teaching might be carried out on a wider basis, as asked for by "Syntax," and the

various colleges would stand or fall by their own actual merit, and not simply by the results of examinations. Make them State institutions as on the Continent; then, and not till then, all will be well with veterinary education.

OUR FOOD SUPPLY.

BY ALFRED HOLBURN, M.R.C.V.S., CHIEF VETERINARY INSPECTOR, MANCHESTER.

It is the popular custom among Farmers and Stockowners in this country to slaughter any diseased or dying cow, sheep, calf, or pig, and endeavour to pass on to the public the carcase for human consumption.

In consequence of the remarkable statements which the Daily Press has brought to our notice during the past few months regarding the Chicago canned meat trade, the people of this country have naturally been thrown into a state of alarm as to the purity of their food supply. Upton Sinclair's "Jungle," is responsible for the revelations, and whether the statements be true or false, considerable good has already been done by the public interest which has been aroused in this question generally, and Upton Sinclair is to be congratulated.

The food supply of the people is a problem of great magnitude. Upon it not only depends our individual growth and development, but our usefulness in this world's great enterprise—labour and progress; to supply a food to the people which would have a tendency to rob the body of the adorable activity it now possesses would simply mean the establishment of a national decay, a civil war, an adder in the grass, the stamping out of a nation.

The provision even of a wholesome food for adults must be considered secondary to the care of the juveniles, and the obligations of a parent to his child in this respect is one of great moment, for in infancy and childhood the foundation is laid for the future being. A mere existence is not asked for, a weakly or stunted child is not a parent's delight, and such an individual cannot have any prospect of a future. It is an unprofitable speculation, a burden drawing on the resources of the home rather than adding to them; hence there is no more urgent calling upon our parentage than the proper feeding of children. Indeed it is more than a parental calling, it is a national one, for the glory of a man is in his strength.

We may ask what guarantee a parent has that he is being supplied with a wholesome, unsophisticated diet. The articles which go to make up our food supply of to-day are very numerous and divergent, they come from home and abroad, they are from various sources, some natural and some prepared, and they are compounded in many forms, consequently, the man in the street cannot be expected to have any special knowledge of the purity or otherwise of the food he eats. His protection, therefore, chiefly lies in the part played by the Local Authorities in exercising the powers invested in them over this department of public health work, and it may not in every case be worthy of the name "protection." It should be remembered, however, that it is the solemn duty of every Local Authority to protect the public against food poisoning. It is one of the duties for which members of Council are elected to the Administrative Board, an obligation which they owe to the people by Statute; nevertheless, the apathy

displayed by many of them on this most vital point calls for serious comment.

Man is omnivorous, or in other words, requires a mixed diet. No human race is found which lives exclusively upon a vegetable diet. In those countries where the meat of domesticated animals is not eaten, animal food is consumed in the form of fish, amphibia, shell-fish, &c.

The question of our right to kill and eat animals is one of great antiquity; even to-day the right is not unanimously admitted. We may say, however, that from the time of Abraham the partaking of flesh meat has been approved of by Holy Scripture (Gen. xviii. 7, Leviticus xi., Matt. xv. 11, Tim. iv. 3 and 4).

The amount of meat which is eaten depends essentially upon the climate in which man lives. Whilst the inhabitants of the tropics live principally on a vegetable diet, and those of the polar regions almost exclusively upon an animal diet, the inhabitants of the temperate zone live upon a mixture of both food materials. Experience shows that meat is indispensable for the majority of human beings, if they are to remain capable of doing a normal amount of work. The kind of work a man is called upon to do naturally affects his *menu* card.

Imported Foods.

The population of Great Britain and Ireland at the last census was in round figures 41,000,000. Now if we calculate on three feeds a day for each individual, that will mean 861,000,000 meals a week, or 44,772,000,000 meals in a year. The amount of food consumed in the United Kingdom in one year is therefore almost inapprehensible, and it is perfectly evident that few of us have thought what the dinner hour means in our little country. The United Kingdom is incapable of growing sufficient food for the requirements of its population, and consequently we are dependent on the importation of food-stuffs from foreign countries and British possessions.

The importation of food-stuffs into the United Kingdom is a most striking feature in our food supply, and cannot but be of interest to the readers of this Journal,—more in particular with regard to their quantity and value.

The Board of Trade returns furnish us with the following figures as a summary of the value of the imports of food from foreign countries and British possessions for the year 1905:—

Food and Drink	From Foreign Countries	From British Possessions	Totals
(*a*) Grain and flour	£49,714,477	£20,342,813	£70,057,290
(*b*) Beef, including animals for food ...	37,841,591	11,590,157	49,431,748
(*c*) Other foods and drink			
(1) Non dutiable	47,556,990	15,466,150	63,023,140
(2) Dutiable	34,161,070	11,722,591	45,883,661
Totals	£169,274,128	£59,121,711	£228,395,839

An enumeration of articles included in the above table shows as follows:—

A.—Grain and Flour.

Wheat, barley, oats, buckwheat, rye, peas, beans, lentils, maize, rice, malt, wheatmeal and flour, oatmeal, maize meal, meal and flour of other kinds, offals of corn and grain, farinaceous preparations.

B.—Meat, including Animals for Food.

Living animals:—Cattle, sheep and lambs, swine. *Meat:*—Bacon, fresh beef, salted beef, hams, fresh mutton, fresh pork, salted pork (other than bacon and hams), rabbits, unenumerated, salted or fresh; preserved (otherwise than salted) beef, mutton, other sorts, poultry, game.

C.—Other Food and Drink. (1) *Non-dutiable.*

Butter, cheese, chicory, other vegetable substances, cider and perry, eggs; fish, fresh, not of British taking; fish, cured or salted. *Fruit, raw:* Apples, apricots, peaches, bananas, cherries, currants, gooseberries, grapes, lemons, nuts, almonds, other nuts for fruit, oranges, pears, plums, strawberries, unenumerated; dates, dried, unenumerated, dried. Fruit, preserved without sugar, canned or bottled, other than canned or bottled, fruit juice. Honey, hops, isinglass, lard, imitation lard, licorice, margarine, margarine cheese. *Milk:* Fresh, condensed, not sweetened; cream; powder, not sweetened, preserved; other sorts. Mineral water. *Oils, Refined or edible:* Cocoa-nut, cotton seed, olive, palm. Oleo-margarine or oleo oil, pickles, &c., sauces and condiments. *Spices:* Cinnamon, ginger, pepper, unenumerated. *Vegetables:* Raw, dried, preserved by canning, vinegar, yeast.

C.—Other Food and Drink. (2) *Dutiable.*

Beer, raw or kiln dried chicory, roasted or ground chicory, raw cocoa, cocoa husks and shells, cocoa butter, coffee, raw, kiln dried roasted, or ground, coffee and chicory, roasted and ground. *Fruit, dried:* Currants, figs and fig cake, plums, commonly called French, plums and prunelloes, dried plums, prunes, raisins. Juice of limes, lemons, &c., fortified. *Spirits (Foreign):*—Brandy, rum, imitation rum, Geneva, unenumerated spirits, sweetened, not sweetened, foreign spirits of various sorts mixed in bond, British and foreign mixed in bond; liqueurs, cordials, &c. Sugar and cognate articles, refined and candy, unrefined, molasses and invert sugar, &c., glucose, saccharin, candied or drained peel, caramel, drained cherries, chutney, sugared cocoanut, confectionery, flowers in crystallised sugar, canned or bottled fruit, crystallised fruits, imitation fruits, crystallised or not, fruits, liable to duty as such, pulp fruit, preserved ginger, marmalade and jams, and fruit jellies, marzipan, sweetened condensed milk, sweetened milk powder, Nestle's milk food, sweetened soy, tamarinds preserved in syrup, tea, wine.

The following tables may be cited to show the individual amounts and values of some of the most important food articles imported from foreign countries and Colonial possessions for 1905:—

GENERAL IMPORTS OF FOREIGN AND COLONIAL MERCHANDISE.

Animals.

Living Animals	Number	Value
Oxen and bulls	561,937	£9,617,994
Cows	2,830	45,971
Sheep and lambs	183,084	278,753

Meat.

	Weight in cwts.	Value
Bacon	5,498,960	£12,774,855
Beef, fresh	5,037,521	8,931,593
Beef, salted	142,806	202,307
Hams	1,318,302	3,118,372
Mutton, fresh	3,811,069	7,336,490
Pork, fresh	505,633	1,162,370
Pork, salted (other than bacon and hams)	205,965	252,606
Rabbits (dead)	656,078	835,929
Unenumerated, salted or fresh	670,144	1,225,692
Preserved (other than by salting):		
,, beef	598,030	1,789,399
,, mutton	30,111	77,112
,, other sorts (other than bacon and hams)	204,888	780,684
Game and poultry (entered by value only)		999,480

Fish: not of British taking.

	Weight in cwts.	Value
Herrings	602,422	£205,530
Other sorts of fresh fish	279,502	416,120
Shell fish, oysters for food	73,390	64,380
Other sorts of shell fish	78,407	44,496
Cured or salted:		
Canned sardines	228,530	546,140
,, salmon	353,017	929,961
,, lobster	53,145	335,705
,, other sorts	32,749	78,323
Not canned, all sorts	490,232	603,740

Mixed Provisions.

	Weight in cwts.	Value
Butter	4,147,866	£21,586,622
Cream	4,996	19,933
Cheese	2,442,682	6,339,811
Margarine	1,088,259	2,735,736
Lard	2,012,305	3,692,573
,, imitation	194,185	269,098
Eggs (by value)		6,812,436

Milk.

	Weight in cwts.	Value
Condensed, sweetened	483,960	£1,064,111
,, separated or skimmed	374,560	455,323
,, not sweetened	33,944	62,642
Powder, not sweetened	7,164	14,056
Preserved, other kinds	3,308	3,782
Nestlé's milk food	1,856	11,025

We do not wish to further extend these tables by giving the figures for fruit, vegetables and grain, which are equally astounding; indeed, the figures as set out are almost too big to grasp, and will be a revelation to many. They relieve us of any idea of famine and furnish us with a proof of how our population is fed, notwithstanding the fact, as I have said before, that we have to prepare for 44,772,000,000 meals in a year. Besides, we must remember that, in addition to these imports, we have the produce of our own land, which is not easy to calculate. We have an animal population of: cattle, 6,987,020; sheep, 25,257,196; swine, 2,424,919; and Ireland supplied us last year with 224,943 fat cattle, 700,626 sheep and lambs, and 362,791 fat swine. It has been stated that our meat trade occupies the third position in the commercial industries of the country.

From the point of view of Public Health we have to satisfy ourselves that this large quantity of food is handed on to the public in a wholesome, unsophisticated condition. It is our duty to insure the protection of health and the prevention of fraud.

Unsound Food (Vegetables).

The dangers which the consumption of food may cause to human health arise from disease, decomposition, contamination, or adulteration of the article. Flesh meat is regarded as requiring the most supervision; at the same time those of the vegetable kingdom must not be forgotten. Grain and vegetables are subject to many parasitic diseases which render them unfit for food. Unripe and over ripe fruits are to be guarded against; and the presence of injurious preservatives and colouring agents in preserved fruit and vegetables must also be borne in mind. Tapeworm infection and the presence of seat worms in children are not infrequently the result of eating raw vegetables.

Adulteration.

The vicious practices of adulteration and the use of injurious preservatives and colouring agents in our foods urgently needs considerably more attention than is given to it.

From the Local Government Returns we find that in 1904, 48,678 samples of foods and drugs were analysed by the various public analysts in this country; of these 7,173 were reported against, showing the percentage of adulteration to be 8·5. Of milk, 36,413 samples were examined and the proportion condemned was just over 11 per cent. Of butter, 15,124 samples were examined and 5·7 per cent. were found wrong. The use of preservatives or colouring matters was reported in 1,914 samples. Throughout the country 3,707 prosecutions were instigated, and penalties imposed in 2,777 cases amounting in the aggregate to £6,528 2s. 5d., excluding costs in many instances. One milk vendor was found at four different times to be selling milk containing 22, 23, 19 and 28 per cent. of added water.

It is not pleasant reading to find our foods adulterated to the extent of 8½ per cent. (milk 11 per cent.); the number of samples analysed may at first sight appear large, but in truth they are infinitesimal; if you deduct milk and butter the samples analysed only reach 17,141 for all other foods, drugs and spirits. Again, the penalties inflicted by the magistrates only average about £2 5s. per case. A

good deal of this is due, however, to the unsatisfactory constitution of the Food and Drugs Act.

The right to use preservatives in food, especially uncooked food, as milk, butter, cream, sausages, shrimps, &c., is a problem not easily settled, for they are very perishable articles. From the quantities of preservatives now used, harmful results are not likely to arise from partaking of one article only, but we must remember that nowadays, two or three articles may be served at one meal, all containing chemicals. Take, for instance an ordinary breakfast, you are likely to get it in your sausage, your bacon, jam, butter, and milk, therefore what is to be feared is an accumulation of small doses which may seriously injure the system. Consequently, on account of their indiscriminate use they cannot be recommended.

Colouring agents are usually not dangerous, being chiefly from animal and vegetable sources.

Judging from the Local Government returns, a considerable fraud is still being carried on by the adulteration of milk with water, and butter with foreign fats, although not so great as formerly, to the enrichment of the manufacturer, or vendor, and to the utter deception of and loss to the consumer. Thus by this practice the public are swindled out of many thousand pounds sterling a year.

Diseased Meat.

Coming now to the consideration or diseased meat, *i.e.*, animal food, the following points should be borne in mind :—

(1) That meat is "unfit" as a consequence of disease in the animal from whose carcase it has been obtained.

(2) That animals suffer from diseases allied to those of man.

(3) That animals suffer from disease transmissible to man.

(4) That diseased animals are slaughtered for human consumption.

(5) That the public knowingly would never buy diseased meat.

From what we know at the present day of the dreaded diseases of animals and also of the enormous amount of flesh meat consumed in the United Kingdom, a most urgent plea is established for a well-organised system of meat inspection; nevertheless it is to be regretted that while England has been described by foreign authorities as the cradle of hygiene, they are astounded at our poor system of meat inspection.

Meat inspection mainly resolves itself into a search for evidences of diseases in the living and dead animal, with the object of preventing the sale to the public of that which is unwholesome. It is essentially the work of the veterinary surgeon, and this is now generally recognised by the medical world and by agriculturists. Our Law Courts, too, have recognised it, although many of our administrative authorities have not yet taken this view.

Town Inspection.

Meat inspection may be divided into a "Town Service" and a "Country Service." In a few towns public abattoirs are provided for the Trade, and in others the animals have to be slaughtered in licensed slaughter houses. As these, together with the class of individual to whom they are licensed, are well-known to the authorities, with

regard to the animals slaughtered in towns a system of inspection could easily be organised which would efficiently protect the public.

The dead meat sent into towns from country districts presents another feature, especially when sent in surreptitiously.

We know that a dressed carcase, without internal organs, after the butcher has finished his handywork, is a huge deception, and in many instances defeats the scrutiny of the most skilled inspector. In order, therefore, to provide against the sale of this kind of imported meat it would appear that the Local Authority should erect some suitable place as an examination station for the reception of all such meat and compel the production of all internal organs, making it compulsory for all vendors to submit the carcase to a veterinary examination before it can be exposed for sale.

In a town where a dead meat market already existed this would act as the place where inspection must take place.

Country Inspection.

It is not intelligible that meat inspection should be left entirely in the hands of borough authorities; urban and rural districts should exercise their part. It may be argued that diseased meat is not consumed in the country villages, but is sent into towns. This is partly true, but it does not relieve those districts from their duty. There is no justification by which County Authorities permit the slaughtering of diseased animals in country districts, which prevails to an alarming extent. This is not only due in cases of emergency sickness, where an animal has been taken suddenly ill at its homestead, but we are aware of the fact that at public cattle markets and auctions held throughout the country there are a class of men commonly called "slink butchers," who resort there for the purpose of buying any thin, worn out, or chronically diseased animal for the purpose of having it slaughtered, at anything from 5s. to £5.

To show to what extent diseased animals are slaughtered in country districts, I may say that last year I condemned thirty tons of country dressed meat alone, consigned to the Manchester market. Moreover, this may be called selected meat; it had been dressed in the country and evidently considered passable. We cannot imagine a man buying an animal, dressing and consigning the carcase to a market for the notoriety of having it condemned. No, he trusted to his skilful work to deceive the inspector. How much diseased meat, therefore, must be sent to places where the butcher knows it will escape inspection and be consumed? There is practically no attempt made by the administrative county councils to suppress this deplorable practice. There is no need to speak of Chicago. We are too lamentable at home, and the preface to my article is true.

It is very necessary that this surreptitious slaughtering of animals in country districts should be stopped, and to do so it seems to me that very extreme measures will have to be adopted to safeguard the public against such a hideous practice.

I would suggest: (1) To prohibit by statute the slaughtering of animals for human consumption other than in a licensed slaughter-house (exception might be made in the cases of pure accident).

(2) Butchers, slaughtermen and meat salesmen to be licensed by

Local Authorities annually, from the time of commencing their apprenticeship, under conditions as to integrity, observation of laws, &c.

(3) The compulsory selection, by the County Authorities in wide rural districts, of certain villages or other places for the erection of a slaughterhouse for the convenience of stock owners.

(4) To give the farmer confidence by providing qualified inspection (times to be arranged).

It should not be lost sight of that the question is one of Public Health, and our first consideration should be to provide means by which these people can carry out with a minimum amount of cost and trouble what is required of them, and thus encourage them to be honest.

Conclusion.

The strength of a chain is judged by its weakest link. The weakest link in the sanitation of this country is now its food inspection, and I am sure the seriousness which underlies such an uncontrolled system demands that at least as much vigilance shall be exercised in this as in other branches of sanitary work. Moreover, I am perfectly confident that butchers and farmers themselves would welcome a thoroughly uniform system of inspection definitely set out by law and executed by proper officers.

Extension of Legal Powers.

The country ought not to be in a position for any public scandal to arise out of its food supply; it is a reflection on its government, on its laws, and the execution of them.

Amendments require to be made at once in the "Sale of Food and Drugs Acts," dealing with adulteration, &c., and in the Public Health Acts, dealing with the seizure of unsound meat, more particularly as they apply to England and Wales. In the Provinces, as the Law stands at present, unsound food can be seized under the three following conditions: (1) When exposed for sale; (2) when deposited for the purpose of sale; and (3) when in preparation for sale; but a person can only be summoned to Court when there has been actual exposure, &c. Consequently, if I found a man making sausages out of dog meat, unless they were exposed for sale, I could only seize them and no prosecution could follow. This has been recently decided by the Lord Chief Justice in an appeal case, Firth *v.* McPhail. Our Parliamentary powers, therefore, call for immediate revision.

Food Regulations.

Apart from the powers to inspect and seize food, there is great need for more rigid regulations in regard to the conditions and management of places under which food is prepared and stored for human consumption. There is just as much need for this as the licensing of private slaughter-houses. All meat shops, factories, warehouses, store rooms and other places where food is prepared or stored for consumption, ought to be approved and registered annually by the Local Authority; so that full sanitary requirements and inspection could be complied with. This should apply to rural districts as well as towns. Al preserved, tinned, or bottled goods, whether meat, fruit or vegetables,

should bear the name of the firm who prepared it, the description of the article and the date of preparation.

These conditions should also be required in the case of all goods supplied from foreign countries and the colonies. The names of the vendors should be first entered at the House of Customs; the goods conspicuously labelled with the name and address of the firm who are responsible, a description of the article, and the date of preparation. These firms should be periodically visited by a government inspector from this country, and the government should have power to prohibit the landing of, or confiscate, any goods that did not meet with their approval. Further powers should be given to the Custom House officers and Port Sanitary Inspectors to examine and seize food at the port of landing. It is essential that large consignments of bad food should be stopped at the port of landing and thus prevented from being distributed throughout the country.

I am convinced that to have an efficient system of meat inspection in this country—a condition which ought to exist—the government should recognise and authorise the constitution of a Food Inspectors' Department under every local authority in the United Kingdom—apart from other sanitary work—under the administration of a veterinary surgeon.

I do not advocate that every meat inspector should be a veterinary surgeon. It will be gathered from the tables which I have recorded that meat inspection is a very wide subject and embraces the inspection of goods which are not necessarily included in the veterinary sphere, but the most important certainly are. Indeed, our scientific training in pathology, hygiene, and chemistry, enables us to render the only true qualified assistance in all branches of food inspection. There should be, therefore, a Chief Veterinary Officer over the Department of Food Inspection, with a staff of trained men under him; and these, if not veterinary surgeons, should hold some certificate of competency, such as is granted by the Royal Sanitary Institute, London.

There is a future for the veterinary profession in our food inspection, and there is protection to the health of the public when they will recognise it. We must, however, rise to the occasion, and I would suggest that our training colleges should institute a more extended course in meat and food inspection. It is quite necessary that special lectures and demonstrations in this subject should be given by the pathologist and chemist, and also by a practical meat inspector.

INFECTIOUS ABORTION IN CATTLE.*

BY PROFESSOR B. BANG, COPENHAGEN.

TEN years ago I published the investigations of myself and my assistant, Mr. Stribolt, on the etiology of *Infectious Abortion*. Next year my treatise was also published in English in *The Journal of Comparative Pathology and Therapeutics* (vol. x.), and for the details referring to this article I limit myself to a short review of the chief points.

In killing pregnant cows showing premonitory symptoms of abor-

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tion, but before the os uteri had opened itself, we found in the uterus, between the mucous membrane and the fœtal envelopes, an abundant odourless exudate, a dirty yellow, somewhat thin pultaceous material of a slimy, somewhat lumpy, character. This exudate contained in pure culture a short and fine bacillus, whose body contained one, two, or more, rarely three, granules, taking the stain more readily than the body. The bacilli lay partly free in the fluid, partly in dense heaps included within large cells.

These bacilli were easily cultivated in test tubes containing serum-gelatine agar. If such tubes were placed in an incubator, there appeared after some days a great number of very small colonies, which almost always developed in a definite zone of the tubes, lying about ½ cm. under the surface of the nutritive medium, and having a thickness of from 1 to 1½ cm. This highly peculiar behaviour towards oxygen enabled us to recognise the specific bacillus even when it was present in impure cultures, as is the case when you examine the exudate covering an after-birth which has been manually removed some hours after parturition. After opening the uterus other bacteria of course find their way to the exudate.

Moreover, we found that the bacilli throve well in glycerine-bouillon mixed with serum, if we let pure oxygen pass through the fluid and then closed the neck of the flask by means of melted paraffin, a method which we use for preparing pure cultures on a greater scale.

In order to prove that the bacillus, discovered by us, was the cause of epizootic abortion, we inserted cultures of it into the vagina of pregnant cows. After a little more than two months one cow aborted, and another was killed, showing evidently premonitory symptoms of abortion. In both cases the uterus contained the above mentioned typical exudate, with the abortion bacilli, and in the case where we killed the cow before it had aborted, the bacilli were found in pure culture. In the other case some other bacteria, namely micrococci, had already found their way into the exudate, although the examination was made six hours after the act of abortion. A pregnant ewe inoculated intravaginally a little more than two months before lambing, gave birth to two living lambs, but on the surface of the much congested chorion we found specific exudate containing an immense number of the abortion bacilli.

Our experiments on cows proved the power of our bacilli to produce abortion, and as we found the bacilli and the specific exudate in all the numerous cases of contagious abortion from which our colleagues sent us specimens, there can be no doubt that the abortion-bacilli are the cause of this disease.

Although in most cases I did not find the uterine mucous membrane strikingly altered, I maintained the opinion that the epizootic abortion ought to be regarded as a *specific uterine catarrh*, because I thought it most probable that the very abundant exudate, which contained a quantity of shed epithelial cells, pus cells and detritus, was furnished by the uterine mucous membrane, and not by the thin chorion. At present I do not attach much importance to the question whether the mucous membrane or the chorion is the chief furnisher of the exudate. I admit that, as a rule, the chorion shows more inflammatory alterations than the mucous membrane, and in all cases where I had the opportunity of examining the fœtus I was able to cultivate the

bacilli from its intestinal contents; in some cases also from its blood and from various organs. Whether the disease begins on the mucous membrane or on the ova, the latter is probably always affected.

Infection.

I think that most people nowadays admit that *Epizootic abortion is a contagious disease*, but as in many cases it is not an easy task to find out how the cows have been contaminated, there still remains a certain doubt by many observers. For a great deal this depends upon the fact that we have as yet known too little of the way in which the bacilli enter into the body of the pregnant cow. The general opinion has been that the *sexual organs* form the port of entrance, and it is commonly believed that the infecting germs are occasionally taken in through the vagina, the external parts of the genital organs of the cow being brought into contact with infected objects during her sojourn in the byre. Our above-mentioned experiments prove the possibility of this occurrence. But I wish to call attention to the fact that *copulation* must afford the most favourable opportunity of all for infection, as that is the only way in which a direct introduction of the virus into the uterus can be effected.

Although long ago some authors—*e.g.*, Penberthy—have spoken of the bull as a carrier of the contagion, and Sand in 1894 published several observations of this kind, communicated to him by Danish veterinary surgeons, as a rule too little importance has been attached to this way of infection. Danish and Norwegian colleagues have informed me of many cases in which abortion was evidently introduced into a hitherto sound herd by a bull that had served aborting cows. And in the year 1905, Mr. Isaachsen (Norway) in his excellent treatise on abortion, published several similar observations.

One of the most striking examples, for which I am indebted to Mr. M. Poulsen (Ringsted), I have already mentioned in my first paper; since then, I have collected a great number and published them in *The Danish Veterinary Journal* for 1898. As Mr. Poulsen's observation is at the same time an excellent example of a successful *rational* prophylactic treatment of a newly imported contagious abortion, I will quote it again.

A farmer who owned sixteen cows, among which abortion had never occurred, nine years ago allowed seven of his cows to be served by a bull at a neighbouring farm where abortion had prevailed for some years; all these seven cows aborted, and no other. When the cows began to show signs of impending abortion they were immediately removed from the byre and put into another stall. By all seven cows the after-birth was retained, and Mr. Poulsen therefore had it removed by hand within twenty-four hours. The removal was complete in the case of six of the cows, but not in the seventh, which became emaciated and was soon afterwards sold. After the removal of the after-birth the cows were for some time daily washed out with carbolised water, and they were not readmitted to the byre until some considerable time afterwards, when they appeared to be entirely free from discharge. During the following year the six cows again became pregnant and carried their calves to full term. No case of abortion has since then occurred in this herd.

I think everyone will admit that in such a case the bull had been the carrier of the contagion.

A reason why people have hitherto been less inclined to suppose that the cow has already been infected by copulation is, I suppose, the idea that the period of incubation is as a rule a short one. When the cow aborts at a rather late period of the pregnancy people will not easily suspect the bull. It is, therefore, of interest to see that in Mr. Poulsen's case five of the cows aborted at ten weeks, one at three months, and only one at four-and-a-half months before the normal end of pregnancy. In some other cases where the cow evidently was infected by the copulation, it aborted four to eight weeks before the end of pregnancy, whereas in other cases it happened in the seventh month. Thus it is evident that the specific abortion catarrh has a very insidious course.

I am fully convinced that the bull is very often the carrier of the contagion, and in the struggle against the disease it is absolutely necessary to take measures for prohibiting this danger. On the other hand, I know many examples where it is impossible to explain the infection in this way, and where it seems also impossible to ascribe it to an accidental soiling of the genital organs of the pregnant cow with infectious material. I especially refer to those cases, where on large farms the heifers are kept in separate byres, isolated from the cow byres, where the heifers are served by a young bull that has never been in connection with cows that have aborted, and where, nevertheless, a considerable number of the heifers abort, as happens very often indeed.

Nocard has already called attention to the possibility that the agents of infection sometimes might be taken in through the respiratory or digestive organs.

In order to examine if the abortion bacilli were able to be introduced into the pregnant uterus in other ways than through the vagina, we made at first some experiments with *intravenous injection*. On two pregnant ewes we injected in the vena jugularis 18 and 8 cc. of a bouillon-serum culture. They were both rather close to the lambing, and it may be doubtful if the small living lambs they bore came much before time, but in both cases I found on the chorion the specific exudate with abortion bacilli. Thus it was proved at least that the bacilli could be introduced into the uterus through the blood stream.

At the same time we injected into the jugular vein of a pregnant mare about 25 cc. of a bouillon-serum culture. Twenty-nine days later she gave birth to a very small living foal, which died on the second day. Here also there lay on the chorion a considerable quantity of the muco-purulent flaky exudate, containing masses of abortion bacilli.

This single experiment does not of course prove that epizootic abortion among mares is always determined by the abortion-bacillus, it only demonstrates that this may be the case, and reminds us not to neglect precautions in order to protect mares against infection from aborting cows.

On a four-year-old cow coming from a farm where abortion never existed, we injected on June 12, 1897, 36 cc. bouillon-serum culture into the jugular vein. The cow was pregnant in the fourth month. Three months later it aborted, and the after-birth was covered with exudate containing abortion bacilli.

Since that time we have made more similar experiments with cows, sheep, goats, and rabbits, and produced abortion in this way.

Intravenous injection of abortion is followed by fever the first day, but the animal soon recovers, and if it is killed after the abortion there are no pathological changes in the organs except in the uterus. It is evidently only in the pregnant uterus that the bacilli find the conditions which they demand for their development.

When the bacilli can be carried to the uterus through the blood, it were also possible *that the pregnant animal could be infected through the alimentary channel.*

An eight year old cow, covered March 14, 1897, on a farm where abortion did not exist, we gave per os ¾ litre bouillon serum culture on June 12, and on September 7 we gave it again a good deal of exudate from an aborting cow. On November 26 it bore a small living calf, and the after-birth was covered with typical exudate, rich in bacilli.

Two years later we repeated this experiment under conditions which excluded every possibility of infection in any other way than through the feeding. A heifer which had lived since her first days in my laboratory, in stalls where aborting animals never came, was served by a young bull that had been under just the same conditions. About three months later we gave it three fœtal cotyledons from the after-birth of an aborting cow. Fifty-six days later the heifer aborted in the typical way. Thus by this experiment is proved in an incontestable manner that a pregnant cow may be infected by eating parts of an after-birth of an aborting animal, or fodder soiled by discharge from aborting cows. And as I shall show later, on speaking of my experiments of immunisation, I have so often used this method of infection that I am in the right to maintain that cows, as well as sheep and goats, are very easily infected in this way.

This knowledge, I think, is very important in practice. It gives us a sufficient explanation for the infection in many cases in which it was hitherto almost impossible to understand how it had happened; for instance, the common infection of heifers, kept in separate byres and served by a young bull that never was in connection with aborting cows. In such cases it is natural to suppose that the fodder has been soiled by means of persons whose boots or shoes have been in contact with discharge from aborting cows, or perhaps by small animals which carry particles of such discharge from the infected byre. It explains also much easier than the common theory of vaginal introduction of the infection on the field.

I am inclined to suppose that the alimentary channel is indeed one of the ways in which the infection is most commonly transmitted. At least it is evidently necessary to have regard to this fact in our struggle against the abortion. It is not enough to prohibit infection by the bull, nor to clean and disinfect the hind part of the pregnant cow and the gutter behind the cows. We must also prevent the soiling of their fodder, which is indeed no easy task to fulfil.

We have every reason to believe that the abortion bacillus is a *purely pathogenic bacterium*, and has no saprophitic existence. The peculiar demand for a certain tension of oxygen makes this highly probable, and the fact that the bacillus, if we introduce it into the bloodstream, does only grow in the pregnant uterus and in the fœtus speaks for the same. But like many other pathogenic bacteria—*e.g.* the tubercle

bacillus—the abortion bacillus is able to remain alive outside the animals for a very long time. I found that uterine exudate, collected in sterile test tubes and placed in the ice-chest, after seven months contained living bacilli, able to grow when we sowed them in agar-serum. The great vitality of the abortion bacilli is also illustrated by two cases, where in the uterus I found a mummified fœtus, surrounded by a large quantity of yellowish-brown, tough, tenacious exudate, containing living abortion bacilli, although the death of the fœtus had occurred respectively five and nine months before.

This great vitality of the bacillus is evidently a factor of great importance, when we have to consider *the means of combating the disease.*

Treatment.

This question must be divided into two or three: first, the treatment of the already afflicted animal, then the prophylactic measures, and these may again be divided into private and public measures.

When we know that abortion is the result of a very insidious inflammation of the uterus, which doubtless exists months before the cow shows the first premonitory symptoms of abortion, it seems scarcely probable that we should be able to stop this disease by any medicinal treatment of the pregnant cow. Brauer recommended to inject every fortnight 20-30 cc. carbolic water (2 per cent.) in the subcutaneous tissue of all cows pregnant in the 5th to 7th month. This method has been used in a great number of cases, but the results seem to have been rather uncertain, and it is highly probable that the good results which are published from many observers depend much more on the careful disinfection of the hind part of the cow and of the byre, which Brauer also recommended, than upon the introduction into the body of a rather small quantity of carbolic acid. On the other hand, this treatment being quite innocuous there is no reason to dissuade from trying it, if anyone wants to do so. From a modern point of view it seems natural to try a serum treatment of the abortion, not only as a prophylactic but also as a curative measure, and I know that a Danish veterinary surgeon has injected pregnant cows in aborting herds with serum taken from cows which had aborted three times. I do not exactly know the results, but I do not believe they have been evident.

Maybe that a serum of higher antitoxic power were able to cure, or at least to communicate a certain degree of immunisation.

For the moment I think it best to limit ourselves to *prophylactic measures.* There is no doubt that in this way we can do very much against this scourge if we base our measures on the solid knowledge we possess of the nature of the disease and of the ways in which it may be communicated.

As *the uterine exudate is the chief bearer of the bacilli*, it is evidently of the highest importance to *prevent this exudate from being spread in the byre.* A cow that shows premonitory symptoms of abortion should therefore as soon as possible be removed from the byre and placed in a separate stall, which could be easily disinfected after the abortion. If the cow has already given some discharge, all this must be destroyed and the cowstall carefully disinfected. If it be absolutely impossible to remove the aborting cow from the byre, it should at least be iso-

lated as well as possible, and all care be taken to prevent spreading of the discharge in the byre.

As the fœtus itself and the after-birth also contain numbers of bacilli, both of course ought to be buried or otherwise destroyed. It may perhaps not be unnecessary to draw attention to this in cases where abortion occurs in the field. If the aborted calf is alive, it ought to be remembered that there may be abortion bacilli on its skin and in its fæces.

After the abortion the womb of the cow must be most carefully cleansed and disinfected. If the after-birth does not come it ought to be artificially removed (this ought to be done on the first day), and the womb should be carefully rinsed with some antiseptic solution several times in the first days, as long as it is possible.

A careful disinfection of the womb is not only important as a way of destroying the contagium in order to prevent infection of other cows, but it is also the best way to protect the cow against sterility, and against abortion in the next pregnancy—as illustrated in the above-quoted observation of Mr. Poulsen.

If the womb is not disinfected, there will probably remain alive in it some abortion bacilli, which will begin their fatal work again as soon as the existence of a fœtus in the uterus produces the necessary conditions for their growth.

The knowledge now acquired of the ease with which abortion bacilli infect by means of the alimentary channel must, as already stated, make the very careful destruction of the discharge from an aborting cow a more imperative measure than ever.

The part of *the bull* as a carrier of the contagion compels us to do our utmost to prevent infection by means of copulation. A cow that has aborted should never be taken to the bull before all discharge has disappeared, and even then not until some months after abortion; and a bull from a sound herd should never be allowed to serve cows from a herd in which abortion has occurred, and *vice versa*. The custom (very common in Denmark) of keeping an excellent bull to serve the best cows of all the members of a society for the improvement of the breed gives a great risk of spreading the disease. In such a bull society it is highly important strictly to maintain the regulation that an aborting cow is not to be served before the uterus is carefully disinfected and a long time has passed since the abortion. In the Norwegian report for the year 1903 is quoted the observation that abortion, which formerly was very common in a certain country district, almost disappeared as soon as this regulation was strictly followed.

If there is any possibility of the bull being soiled by discharge containing abortion bacilli, the prepucial sack should be very carefully disinfected after copulation by means of rinsing it with a great quantity (Isaachsen says not less than 6 litres) of a tepid solution of some antiseptic fluid, *e.g.*, lysol ½ to 1 per cent., or septoform ¼ to ½ per cent., with soda 1 per cent. (Isaachsen). The fluid is introduced by means of an irrigator with indiarubber tube, and most bulls agree to this little operation. This method has been used rather commonly in Denmark and Norway, and very often with good results. On some farms they not only disinfect the bull after the copulation, but also before it, which does not seem to diminish the fertility. A

farmer, instead of irrigation, bestrewed the penis before and after copulation with iodoform, and it is said that the abortion then disappeared (Albrechtsen). The hairs round the orificium præputii should always be cut short and washed with antiseptic water before and after the copulation.

A circumstance not to be forgotten is that a cow that has calved at full term may nevertheless sometimes furnish a vaginal discharge that is infective. Abortion often occurs very late in the pregnancy, so it is easy to understand that sometimes the cow may carry her calf to full term although the specific inflammation exists in the womb. That this happens is not only observed by trustworthy observers, it also happened in some of my experiments. It may perhaps be assumed that in such cases the bacilli are less virulent than usual, but the possibility of spreading the disease by the discharge from such cows—also by means of the bull—ought not to be lost sight of.

Prevention.

If the farmer understands the disease he can do very much to protect his herd against it. The best means of avoiding this disease—as other contagious diseases—is, of course, to keep his herd *quite separate* from others. He should not allow his bull to serve foreign cows if he is not absolutely sure of their coming from a sound herd, and if he is obliged to use a foreign bull he ought to make the same reservation. If a farmer is obliged to buy a cow it should be kept separate from the others until it has calved at full time and without giving a suspicious discharge, &c.

Formerly many farmers tried to get rid of the disease by selling the aborting cows and buying new ones. This is a bad measure, because as a rule the imported cows will incline to aborting and thus serve as new fuel to the fire. It is wiser to keep the cows that abort and disinfect the womb carefully enough to free them from the disease. Even if this is not done the abortion will, as a rule, only recur two or three times, and the damage will in this way be less than if new cows are imported year by year.

A risk of contamination which is, I believe, kept too much out of sight, is that connected with neighbours or other persons (perhaps also animals) coming from infected byres and carrying the germs to a healthy one. I know at least several cases where a healthy farm seemed to have been infected in this way, and it does not seem at all improbable that we might now and then find the explanation for an otherwise incomprehensible outbreak in the soiling of the fodder by such intercourse.

The question of *public measures* against epizootic abortion has been discussed in several countries, but as far as I know Norway is the only country where abortion is a scheduled disease. According to a Royal resolution of June 22, 1903, infectious abortion is scheduled under the so-called "milder contagious diseases" (law of July 14, 1894, § 14). The owner is obliged to report when such a disease is found in his herd, and he is not allowed to bring animals that he thinks seized with such a disease to fairs or cattle shows, to a foreign byre or field, or to sell it otherwise than for slaughter. But as a cow that has the abortion inflammation in the womb does not show any symptoms at all of a disease until a few days before the abortion, it does not seem likely

that these regulations will diminish the spreading of the disease greatly. They are, nevertheless, of some value, inasmuch as they may serve to call attention publicly to the fact that abortion is an infectious disease, and that it is unfair to sell an aborting cow to a man who does not suspect that the animal may perhaps introduce into his herd a most disastrous disease.

It is, of course, a very difficult task to legislate on abortion, because the disease is so common that it is difficult to maintain draconic measures against it. The want of symptoms until a short time before the abortion, and the fact that not every case depends upon infection, will in many cases seem to excuse the seller.

Notwithstanding the difficulties, I think it necessary that the State interfere in order to protect the farmer against the heavy losses which may follow the introduction of abortion into his herd. It should not be permissible to sell cows or bulls from an infected herd without indicating the existence of the disease, nor should such animals be admitted to common grazing. From Norway, where common grazing in the mountains is in many places the rule, Mr. Isaachsen cites many observations of the spreading of the disease in this way. He also mentions the great risk connected with the unfair traffic in diseased animals—farmers who have struggled ineffectually against epizootic abortion auction their herd and thus spread the disease to many unconscious fellow-men.

It is highly probable that the diverging customs will require diverging laws or regulations in different countries, and I shall not try to discuss these questions in detail. One thing is sure, that in addition to, or perhaps before, such regulations, much work must be done to enlighten the farmers on the true nature of the disease and on the ways in which it is propagated. Without this the best laws will not give the results which could otherwise be expected.

Immunisation Experiments.

The fact that abortion inflammation has a natural tendency to die out in a cow after several abortions leads us to believe that the aborting cow acquires a certain *immunity*. The degree of immunity is not a constant one, as some cows, luckily very few, continue to abort five times, and although most cows only abort two and three following years, it sometimes happen that they abort again after one, two or more normal parturitions. Notwithstanding this fact, which seems to prove that not every cow possesses the same power of producing antitoxic or antibacterial substances, it seemed to me to be a useful task to try to find out *whether it was possible or not to confer immunity against abortion by means of introducing the specific bacillus or its products into the body of the animal before pregnancy.*

During the last few years we have made several experiments with cows and with sheep and goats. The first two years we tried to immunise by means of *intravenous injections of living bacilli* (pure culture in serum-bouillon) some time before copulation, and when the animal was pregnant we infected it either by feeding it with culture, or with parts of an aborted afterbirth, or by intravenous injection of culture. As might be expected, it is much easier to protect against infection by feeding than against infection by intravenous injection. Out of eight sheep which had injections into the jugular vein several times in the

course of a year (six, six times; two, three times) with a serum-boullion culture, four were fed with abortion bacilli, about 70 cc., four injected intravenously 10 cc. The first all bore their lambs to full term, the latter all aborted. As infection under natural circumstances must correspond more to a feeding experiment than to an intravenous injection, we limited ourselves in the future to the first way of infection in order to control the degree of immunity we had conferred.

In the year 1903-1904 *four heifers and one cow* were injected once (1) or twice (4) into the jugular vein with 10 cc. of a serum-boullion culture. Having conceived, they were fed, four with culture (70 cc.) and one with exudate. Three carried their calves to full term, but two aborted. One not vaccinated heifer aborted three and a half months after feeding.

This result does not seem to be good, but on closer examination we find that the two vaccinated animals that aborted received the intravenous injection a rather short time before the copulation—sixteen and twenty-six days before—whereas the three resisting animals were injected sixty-six, sixty-seven and one hundred and ninety-six days before. It seems, then, rather probable that bacilli injected into the blood some weeks before copulation may remain alive in the body and be able to grow in the uterus if the cow conceives. On some farms where I tried vaccination by intravenous injection of bacilli I found similar results.

An experiment with goats gave the result that two not vaccinated aborted two and three and a quarter months after eating 20 cc. of culture, whereas, of five goats vaccinated intravenonsly twice with 10 cc. of culture, *three carried their kids to full term* and *two aborted*. They were all fed either with culture (20 cc.) or with exudate. The two aborting were both vaccinated a rather short time—eleven and twenty days—before the copulation, the others were served a little later.

By the experiments with intravenous vaccination of cows we made the curious observation that while they never showed any pathological symptoms immediately after the first injection (that they got some fever later I have mentioned before), a second, and especially a third injection, as a rule produced very marked symptoms of disease. After the second injection they turned dizzy and breathed frequently, and sometimes they fell down for a moment. After a third injection * they suddenly fell down immediately after the cannula had been taken out of the vein, respiration was very frequent (ninety times to a minute), and they looked so weak that we feared they would die. After some minutes they got up again, would not eat immediately, but soon recovered.

Although there does not seem to be any real danger connected with these peculiar accesses, they evidently make the intravenous injection a very unpractical sort of vaccination if it is to be used more than once or twice, and the fact that an injection into the vein one month before copulation involved a certain danger of producing abortion instead of vaccinating against it, also made it very desirable to find better methods. We therefore made several experiments on the effect of *subcutaneous injection* of cultures containing living bacilli and of such cultures in which the bacilli were killed by means of toluol.

* The observations here mentioned belong to an experiment, made in 1903, which gave no result, because the cows would not conceive.

In the year 1904-1905 we made several experiments with sheep and goats. Some of them gave no satisfactory result because the exudate which we used in order to produce abortion by feeding seemed to be non-virulent, as the control animals did not abort nor did those vaccinated. In other series where we used cultures for infection the control animal aborted, while the vaccinated animals—nine sheep and seven goats—carried their lambs and kids to full term. Of the sheep, two were vaccinated intravenously and four subcutaneously with living cultures, three with cultures in which the bacilli were killed by means of toluol. For the goats the corresponding figures were two, three and two. In almost all cases the injections were repeated several times, and the total quantity given to each animal was about 30-40 cc. These experiments, then, seemed to prove that the immunising power of the culture was the same when the bacilli were introduced under the skin as when they were injected into the blood, and even if the bacilli were killed by means of toluol. Further experiments made in the *last year*, however, proved this not to be the case.

Fifteen goats and two sheep vaccinated by means of subcutaneous injection of living culture (50 to 70 c.c. as the average to each animal, divided in five to seven doses) carried their kids and lambs to full term, although about two and a half months after conception they were fed with a great quantity (about 40 c.c.) of exudate from an aborting cow, a feeding which produced abortion in four not vaccinated control goats. Quite different was the result of the vaccination by means of subcutaneous injection of a corresponding quantity of culture in which the bacilli were killed by means of toluol. Of ten goats vaccinated in this way and fed as the others, seven aborted, and only three carried their kids to full term, and of two sheep treated in this manner one aborted and one carried to full term. Thus it seems evident that cultures in which the bacilli are killed have not at all the same immunising power as living cultures.

As to the *duration* of the immunity, we had opportunity to make the following observation: In 1903 five old goats, and four of them again in 1904, were treated with intravenous injection of living culture, and both times carried their kids to full term, although they were fed with virulent matter. In 1905 we did not vaccinate them, but in January, 1906, we fed them in the same manner as the other goats. They all carried their kids to full term. This was also the case with the goat that had not been vaccinated since 1903. Immunity acquired by living bacilli thus seems to last a long time.

The main experiment of last year—that with cattle, is not quite finished yet, but I shall here give a preliminary report.

On five heifers we injected subcutaneously in eleven doses a total quantity of about 180 c.c. of culture, in which the bacilli were killed by means of toluol. Some months after the conception we fed them with a rather large quantity of infecting matter (about 200 c.c. of exudate and fœtal cotyledons.) *Three* of them aborted after two and a half to three months, but *two* carried their calf to full term.

Four heifers were injected simultaneously *with living culture* (at the average 140 cc. given in ten increasing doses, beginning with 4 cc. and ending with 40 cc.) Three of them have not as yet aborted, although, exactly as the others, they have been fed with infecting matter three or five months ago.

Only one has aborted, which happened a little more than four months after the feeding, but it deserves to be noticed that in this heifer the injections as a rule produced abscesses, and it does not seem improbable that this may have been the cause of the bad result.

Of four un-vaccinated *control-heifers* one has not yet aborted, but three aborted two to three months after the feeding.

It will be seen that subcutaneous injection of culture, in which the bacilli are killed, has not been able to produce immunity against a strong feeding infection, neither in cattle nor in sheep or goats. In some animals the result has been good, in others not. *Subcutaneous injection of culture containing living bacilli has protected all my goats and sheep.* As to the cattle, I have the hope that most animals will resist, but one heifer, in which the injection produces abscesses, has aborted.

I am far from pretending that I have solved the question of vaccination against abortion, but I think that my experiments have made it probable that it will be possible in this way to get efficient results, and I hope to be able to continue the experiment, perhaps in a somewhat modified form. Whether in future *vaccination* will be the chief weapon against contagious abortion or not, time will show. At present it must be our task to teach the farmers that they can do very much against this disastrous disease by *isolation and disinfection*. The main thing is that they may be made thoroughly to understand the nature of the disease and the many ways in which it spreads.

Clinical Articles.

STRANGULATED INGUINAL HERNIA IN THE BITCH.

BY HAROLD WOODRUFF, M.R.C.V.S., PROFESSOR IN THE ROYAL VETERINARY COLLEGE, LONDON.

OPERATION—RECOVERY.

THE patient was a black and tan terrier about 25 lbs. weight, first noticed to be ill on the Friday. The symptoms were loss of appetite, general dulness, and the presence of a swelling in the left groin. On the two following days the bitch got steadily worse—took no food and showed no signs of pain, but the swelling got larger and firmer.

She was brought to the Clinique on Monday (October 30) and hernia was at once diagnosed. The swelling was now very tense; all attempts at reduction failed; the animal was almost comatose, so immediate operation was advised. Chloroform was administered, the skin cleansed, and an incision made through skin, fascia and peritoneum into the sac, so exposing the hernial contents. These were at first thought to be bowel, but proved to be the whole of the left and part of the right horn of the uterus, livid in colour and partly distended with gas. On gently drawing the organ further out it was possible to put on ligatures: (*a*) in front of the constriction on each horn, and (*b*) on the body of the uterus, so as to allow of amputation of the strangulated portion. The stumps were returned through the inguinal canal to the abdominal cavity, the lips of the external ring drawn together with two silk sutures, the skin wound stitched up and a

dressing applied. The patient was seen on three subsequent occasions when the wound was dressed, and the recovery was uneventful and complete.

On opening the uterine horns some amount of gas was liberated and a good deal of coagulated blood was found, whilst the vessels of the suspending peritoneum were filled with dark, partially clotted blood.

A SALIVARY CALCULUS.

BY JAMES WEBB, F.R.C.V.S., BISHOP STORTFORD.

THE subject was a well-bred chestnut hunter mare, six years old, which the owner never could get into condition. The teeth were apparently all right, but she had a curious habit of always rubbing the off side of the head against the manger or some other hard subject.

When I examined her I found a hard, immovable swelling on the off cheek, about the size and shape of a pigeon's egg, a little way in front of the edge of the lower jaw and plainly situated in the parotid duct.

Diagnosing a parotid calculus I made a longitudinal incision at one extremity of the swelling and the stone was very readily extracted. I joined the edges of the wound together by pin sutures with horse-hair twisted figure of eight fashion around them, and applied iodiform colloid over the whole.

The mare was put on the pillar reins in order that she might not rub her wounds, the food given consisting of sloppy mash and ground oats. After a few days I removed the pins and the wound healed without any trouble.

After the operation the animal rapidly improved in condition and put on flesh.

A CASE OF RUPTURE OF THE STOMACH IN A MARE.

BY CLEMENT BAXTER, M.R.C.V.S., ELGIN.

ON the afternoon of August 8 I was called to a farm four miles from here to see a five-year-old Clydesdale mare which was supposed to have "inflammation."

The animal had been seen in the field about 12.30 p.m. apparently healthy; a short time afterwards she was noticed to be lying and rolling, and was taken into the stable.

I saw the mare about 3 p.m. I found her showing an irregular intermittent pulse, mucous membranes normal and respirations normal. Temperature was 99° F., and there was slight sweating about the shoulders, particularly over the caput muscles on right side. Pain was shown, not by lying down and rising, but by cringing up the body, and by rubbing along the trevis on the right side.

There were no borborygmal sounds, and no actions of the bowels, but there was eructation of gas, which later on was tinged with the contents of the stomach. The pupil was very much dilated, and there was a look of depression.

I administered an anodyne with a stimulant and waited an hour.

The symptoms continued much the same, except that the heart-beats became more regular. I administered a dose of Parke Davis and Co.'s preparation of cannabis indica.

The owner's constant question was: "Do you think there is any inflammation." I felt that the case was not an ordinary one, and my reply to him was that the trouble was in the stomach; I feared there was a rupture, but could not say definitely. I stayed with the animal until 7 p.m., when she was much more quiet, but the other symptoms were as before.

The extremities were cold and there was no sweating, except a little at the root of the ears. During the time I was there the animal lay down once only for about three minutes on the right side, but the attendant informed me that during the time I had been away from the stable she had given one or two "wild jumps" forward.

I went away to visit another farm and also home. I returned to my patient shortly after 11 p.m. I found her standing, not inclined to move, pulse regular, but weaker than before, respirations increased, occasional sighing, pupil dilated as before and the temperarure was 102° F. There was sweating in the flank, under the mane and about the roots of the ears, and the extremities were cold. As time went on there was a stiffness in the hind quarters, with some difficulty of movement but no knuckling of hind legs, as one frequently sees a short time before death. The pulse remained regular, but got gradually weaker, death taking place at 4.20 a.m.

The *post mortem* showed the stomach packed with green food which had been well masticated, and a rupture of the wall 12 inches long. There was some fluid in the abdomen and a limited amount of "mechanical" peritonitis. I have had several cases of rupture of the stomach during my fourteen years practice here, but I never had one with symptoms like the present case. There had always been, in my former cases, more sign of abdominal pain, and then a fairly sudden cessation of pain, followed by copious sweating all over the body, and death occurring quickly.

The symptoms I disliked the most in the present case were the dilated pupil and the depression. The subnormal temperature in rupture of the stomach had not been my former experience. In cases of rupture of the stomach in foals, in addition to the history of the case, the great depression and disinclination to move is, in my opinion, diagnostic. The temperature is not to be trusted in bowel cases.

One is tempted to ask what is the cause of the rupture? Is it spasm, or is it the result of violence when the animal throws itself to the ground during the paroxysms of pain?

In the spring of the year I had a case of ruptured stomach in a 2-year old Clydesdale colt which had been running out to grass and was getting a small feed of oats morning and evening. The symptoms shown by him were attempts to vomit, pulse, respirations and temperature normal. I left the animal and went into the farm house with the owner for half an hour; returned to loose box and found the animal sweating copiously, pulse quick and weak, respirations hurried and nostrils dilated, death taking place two hours later. The *post mortem* showed a rupture 8 inches long.

A CASE OF DROPPED ELBOW; RADIAL PARALYSIS?

BY FREDERICK HOBDAY, F.R.C.V.S., KENSINGTON.

THE patient, a cart horse, was apparently all right before being cast for an operation, and during the process did not appear to fall heavily or struggle very much. Upon removal of the hobbles the animal had difficulty in rising, and upon eventually getting up could scarcely stand, and was only induced to move after considerable persuasion.

When standing the limb showed the position as depicted in the photograph, and when moving it was absolutely unable to bear the weight of the body. There was no crepitus nor any perceptible laceration of the caput muscles. When walking, the leg could be moved forward but was never carried backwards. The elbow was dropped and the toe pressed into the ground.

A case of Dropped Elbow; Radial Paralysis?

When the animal lay down in its loose box it could get up again by placing the forelegs out in a forward direction to the fullest extent, and then springing up suddenly. When standing up it kept stretching its body backwards until the abdomen almost touched the ground, and was apparently in considerable pain. The leg itself, when raised and manipulated whilst the animal was lying down, seemed very limp and fell to the ground. The patient was placed in slings and the hose pipe so arranged that the cold water could trickle constantly over

the caput muscle and point of the shoulder night and day. For two days the legs seemed utterly powerless, but on the third day when the groom went into the box the horse was standing in a normal position, and upon being taken out of the slings it could walk and trot without pain or lameness, using the leg well.

NOTES ON A CASE OF MERCURIAL POISONING AMONG CATTLE.

BY G. D. LANDER, D.SC., PROFESSOR OF CHEMISTRY IN THE ROYAL VETERINARY COLLEGE, LONDON, N.W.

THIS case was remarkable on account of the comparative rarity of mercurial poisoning among animals, and also from the cause of the poisoning.

As the result of a fire at a chemical works finely divided metallic mercury was deposited on the adjacent pastures, and deaths commenced among the cattle some three months later.

On analysis of the viscera and contents metallic mercury in the average proportion of $\frac{8}{25}$ grain to the pound was separated. This may be taken as representing approximately the extent to which the finely divided metal is absorbed.

CREMATION OF AN ANTHRAX CARCASE.

BY HENRY TAYLOR, F.R.C.V.S., HAYWARDS HEATH, SUSSEX.

SOME little time ago a bullock died of anthrax in this district, and the local sub-committee for the administration of the Diseases of Animals Act ordered it to be cremated. Perhaps a few particulars about the cost, &c., may be of use to veterinary inspectors.

An elliptical hole large enough to take in the animal was dug to a depth of 3 feet 6 inches, with four 9 inch draft holes opening below the level of the floor. This, of course, is after the type of furnace recommended by the Board of Agriculture. Three only of the draught holes were found to be necessary in this instance. The cost worked out as follows:—

Digging	...	...	£0 12 0
½ cord of wood	...	...	0 8 0
½ ton of coal	...	...	0 12 0
1 gallon paraffin	...	...	0 1 0
			£1 13 0

The fire was lit at noon and in six hours afterwards only a few bones were left, and the fire had in addition consumed the turf where the carcase had lain.

The following morning at 11 o'clock the fire was composed of red hot ashes, with one or two bones, which when touched fell to powder. Practically speaking the carcase was consumed in six hours.

A DENTIGEROUS CYST.

BY E. R. HARDING, M.R.C.V.S., SALISBURY.

In the early part of 1902 I was asked to see a four-year-old unbroken nag colt, the owner stating that he had a continuous discharge from a very small wound at the base of the left ear on the edge of the conchial cartilage.

I suspected at once that I had a dentigerous cyst to deal with, and upon examination I could feel an enlargement about an inch and a half below the opening of the sinus. As the horse was very vicious to handle, I decided to postpone matters until a few days later, when I took hobbles, &c., prepared to operate. When the animal was cast and chloroformed I found a soft swelling immediately in front of the forehead; I probed the opening and found that the sinus ran forward underneath the swelling. With a director and bistoury I opened the sinus up right away from the base of eye to the forehead, through the temporal muscles, and speedily discovered two distinct hard projecting masses, which eventually proved to be deformed molar teeth.

One was as large as a walnut and the other about three times the size of a filbert. I removed them in turn by the aid of a hammer and chisel, being compelled to use considerable violence. The smaller was situated in the petrous temporal bone, the other in, or on, the parietal. The wound which I made was nearly two inches deep and six inches long. It was dressed on the same and on every other day afterwards with chinosol lotion and iodoform and boric acid powder; the horse, on account of its viciousness, having to be cast every time for the dressing. Recovery was uninterrupted.

FRACTURE OF THE FEMUR OF A CAT.

BY S. HODGKIN AND SON, VETERINARY SURGEONS, HANLEY.

The patient was brought in by a poor woman, with the following history: the next door neighbour kept pigeons, the cat was known to stray in her yard; one day the pigeon owner was seen to deliberately pick up the cat by the tail, swing her round two or three times and dash her to the floor. When she crawled home she could not use her leg, on manipulation no crepitus could be felt, but we put her under choloroform and made an X-ray photograph of the limb, when the fracture was easily discernible. The limb was set in plaster of Paris bandages, and the patient made a good recovery.

ANIMAL DISEASES FOLLOWING WAR.*

BY LIEUT-COLONEL E. H. HAZELTON, A.V.C.

INTRODUCTORY: Animal losses during war: Accidents and surgical diseases: Communicable diseases of animals met with during and subsequent to warlike operations: Diseases not freely communicable met with in war time: Remarks on lameness: Sporadic diseases on active service: The Geneva Convention and horses in war time: Conclusion.

The subject of this paper, viz.: "Animal Diseases following War" is a very comprehensive one, including not only those diseases which are termed specific or zymotic, but others due to a variety of causes such as privation, exhaustion, accidents and surgical cases, and injuries incidental to campaigning. Diseases occurring on board ship, accidents which occur during embarkation and debarkation, disorders due to errors in feeding *et hoc genus omne*, these must all be considered.

We also have to consider the different species of animals used in war in relation to disease; horses of various types, mules, bullocks, camels, even elephants and yaks, all come under the care of the veterinarian in some part of the world, for the sun is supposed not to set on the British Empire, and our wars are not confined to any particular country, but occur in widely separated areas. Thus we are also confronted with the problem of climates, which largely influences disease in animals.

It will be necessary to allude to diseases met with in tropical countries such as India, Burmah and Africa, in countries of arctic cold such as Thibet and North China, or of extreme aridity, as Somaliland, it is therefore difficult to say very much in a paper of this kind on all the diseases we meet with, but I trust that the discussion which will follow may serve to amplify the remarks I have made and to fill the gaps which I have left.

Fortunately the discussion will be in the hands of many who have served their country, and who have had personal experience in the care of animals in time of war, and therefore it will be of deep interest to us all.

The greatest losses in war are not from the shot and shell of the enemy, but are caused by still more powerful foes, namely, privation and disease.

The late war in South Africa was responsible for a wastage of animal life probably unprecedented in the annals of any war of similar duration; one reads of a cavalry regiment using up three thousand horses for its own requirements in the campaign; of one thousand horses being destroyed as useless week after week, and these casualties were not due to disease proper but to privation and overwork. Perhaps this big casualty list was partly due to unsuitable material, but there is little doubt it was largely due to the employment of unconditioned, unfit horses in work too hard for them. There was a want of time to get these horses fit. We all know how difficult it is to condition horses and how very easily they lose condition, and I hope that the lesson of South Africa in this connection has been learnt, for if we

* A paper read before the National Veterinary Association, Liverpool, July 24-25, 1906.

have to do it again, we shall again have to pay the bill, unless we do it in quite a different manner and do not attempt to carry on operations with unfit horses, gathered from all quarters of the earth, and subjected, as a preliminary, to at least a three thousand mile sea voyage.

The losses, either temporarily or permanently, in animals during campaigning from exhaustion and surgical injuries are always great and often unavoidable. I have known cavalry regiments almost dismounted because of sore backs alone; not from badly-fitting saddles or bad riding, but due to sheer overwork. It is easy to explain why these awful sore backs occur, but so hard to avoid their occurrence on a campaign.

Again, from ill-fitting pack saddles and badly adjusted loads on pack animals we find the same injuries to transport animals. It is no uncommon thing to find most of the skin of the hump of the camel adherent to the pack saddle on removal after prolonged marches; especially is this the case with hired animals and little expert supervision.

Enough now has been said on this subject, and when we look back down the long vista of warlike events, it does not matter whether it is in the Far East or nearer home, we marvel at the enormous roll of casualties, and we note the names of heroes among nations, but only those who have had the care of suffering animals in time of war can fully realise the heroism shown by them in man's service, and all of us, as members of a profession second to none in its aims and aspirations for the relief of suffering nature, willingly pay our tribute of respect to the generous creatures who have, we hope, not laid down their lives in vain.

It is well known to us that, notwithstanding rigid inspections and the utmost care exercised by all concerned, if young animals, or even mature animals, are collected in large numbers from countries in which disease exists, it is only a matter of time for such disease to appear in the mass, unless there can be an adequate system of quarantine imposed, which in war is often impossible. (I allude to zymotic diseases here.)

Disease of all kinds follows rapidly in the train of armies, mainly because of the massing of large numbers of animals presents a fine field for the development of the causal organisms, also because these organisms are brought to the scene of operations through the various channels of animal supply, and by the importation of a new animal population there is always the risk of the contraction of indigenous disease, which is probably just as important as any other factor.

In addition, then, to the accidental or surgical casualties of our animals during a campaign, both before and during operations, on lines of communication, and the actual casualties of battle, we have to consider disease in its most open aspect, derived perhaps from sources far removed from the theatre of war, and in order to do so let us consider the communicable diseases of animals during war.

Equinia: Glanders.

I think the disease which merits our early consideration is one we are probably most familiar with, and which is practically always

met with on a campaign, that is glanders. Glanders is no respector of countries. It is met with in temperate and tropical countries, in the east and in the west; it does not vary in its manifestations wherever it is met with, but is the same intractable disorder to-day as it was in the past.

Yet there is a difference, not in the disease itself, but in the manner in which we now regard it. Glanders has lost its terrors to a very great extent, now that it can be diagnosed with reasonable certainty by means of the mallein test. Formerly the only test we knew of was the test of clinical symptoms, and, moreover, it was usual to consider a unit, say a regiment or a battery establishment of horses, among which a clinical case had been discovered as suspicious for many weary months, if not for years, and rightly so at that time, for there is no doubt that it is a disease of the gravest moment, apart from the loss it occasions among animals, owing to the possibility of its transference to human beings.

Now, however, with mallein at our service it is perfectly possible in a few days to discover to what extent units are affected, and to isolate all cases which re-act or which are suspicious without the tedious periods of watching and waiting which used to obtain.

This satisfactory state of affairs is of immense benefit during war. Regiments are now free to move without dread of the appearance of this disease among them except from renewed contagion, they are free to mix with other units, and are not regarded as objectionable neighbours.

Another service that mallein performs is that of rendering the remounting of corps a non-fertile source of glanders, for remounts can be tested with mallein and declared free, which is a great advance on the methods of segregation which are not often possible on active service.

In order to illustrate some of the channels through which glanders may infect an army, I will give some personal experiences.

During the operations in North China, 1900-01, after the occupation of Pekin by the allies, many hundreds of ponies and mules were captured by the different nations' troops; these ponies and mules had been abandoned by the Chinese during their flight from the capital. They were found in large numbers in the Imperial Hunting Park near Pekin, and many found their way into the transport lines of the allies; subsequently many were found to be affected with glanders.

During the winter succeeding the operations, I saw the horses, ponies and mules of practically all the allies, and I saw in the German stables numbers of cases of glanders, not only among the captured Chinese ponies and mules, but also among the Australian horses with which their cavalry and artillery were horsed. I also was asked to inspect the horses of a regiment of United States cavalry suspected of being affected, and was able, with the assistance of mallein, to detect the animals infected.

It is worth remark at this place to note that the German veterinary officers placed but little faith in the efficacy of mallein, and the United States army in North China then had no veterinary service.

In South Africa glanders was one of the diseases met with during and after the war.

Owing to the very many and widely-divergent channels of horse

supply, it is very difficult to say how frequently it was introduced from without, but it is very evident that there was widespread contagion, for after the cessation of operations large numbers of cases were detected in army horses in the country, and during the year 1903-4 ten centres were located and 165 cases discovered in horses and mules, the majority of these being brought to light on the final testing of the army horses with mallein. (See Annual Report, A.V.D., 1903-4.)

During the following year, 1904-5, the disease was noted in only six centres, and the number of cases found had dropped to 33.

The disease was detected among transport ponies during the operations of the Sikkim-Tibet mission in Thibet, 1904, but was readily controlled.

During the operations in Somaliland, 1904, glanders was not prevalent.

I think that enough has been said to show the remarkable extent of area over which glanders may exist. Climate appears to exercise no influence over it either for good or ill; it is the same in the tropics as in the frigid climates of North China and Thibet, but glanders now has no terrors for the veterinarian compared with the days when mallein was unthought of, and as a scourge of equines it need not be accorded the premier position it so long has occupied, because it may now be considered as a controllable disease when conditions are fairly favourable for a systematic attempt to suppress it.

Scabies or Mange.

There is no communicable disease affecting animals in time of war that causes more trouble than mange. It is practically impossible to avoid this disease on active service. All varieties of animals may become affected, and it is the most readily communicable of all diseases that I am aware of.

The conditions under which army animals are placed on active service are often most favourable to the development of scabies; a contaminated camping ground or stable may start it, and it will spread like a fire and no one will be able to say when it will stop.

Horses, mules and camels, especially the latter, are generally attacked. For various reasons we cannot always get our animals groomed on active service, and a dirty horse is a favourable *habitat* for the parasite of the disease. Everything with which that horse comes in contact—saddlery or harness, blankets and brushes—all help to carry on the parasites. Once let a camping-ground be contaminated, then all others using it are liable to contract the disease.

It is just the same with stabling or shelters of any kind, bedding, litter, sand: in fact anything used by infected animals can act as a carrier of the contagion. Even the troopers or attendants will suffice, and once this disease is established only the most thorough and careful measures will prove successful to stamp it out.

Consider the difficulties to be overcome by an army in the field. It is all very well to say isolate, segregate, dress them all over with anything you may prescribe, but corps have to march, troops have to manœuvre and fight, every transport animal is wanted for the lines of communication. They must go on, and so does the disease, and when time and opportunity for treatment arrives, the disease has got a good

start, and as I have remarked, there is no disease which gives more trouble to the veterinary staff than does scabies.

Animals sent to hospitals, depots on lines of communication or at the base, carry it with them, and where they are collected in large numbers mange is a pest.

On service the disease is difficult to treat for the reason that it is difficult to obtain large quantities of oily dressings, which are the stand-by of the veterinary attendant in its treatment, for although there are many remedies advocated, yet those which do not contain an oily base are not so efficacions as those that do, and to transport the quantity of train or fish oil necessary, say, for the dressing of a thousand camels, is no light undertaking.

Of the varieties of scabies the most intractable is the sarcoptic form. We meet with it all over the world, it is common in tropical countries at all seasons; in sandy and arid tracts such as the Frontier of India, Somaliland and Egypt it flourishes.

South Africa can tell of countless numbers of animals affected, and it is not unknown in England.

Rinderpest or Cattle Plague.

Before armies take the field the problem of feeding them has to be faced. Western men, such as men of European nations and the Americans, are more difficult in this respect than are Easterns, for the reason that the former depend so largely on animal food for sustenance, whereas the men of Eastern nations can live and fight on a diet in which animal food does not play a very prominent part; also, although the diet of Western troops in the field largely consists of meat in the canned or preserved condition, yet fresh beef and mutton are desirable, and have to be provided when operations are long continued, therefore cattle for slaughter purposes are collected in requisite numbers and follow armies to be killed and consumed as desired.

Among these herds rinderpest often occurs. Bullocks are largely used for the transport of an army, for draught and pack purposes in various parts of the world, notably in India and South Africa.

Bovines, such as the yâk, are used as pack animals to carry the necessaries of an army in the Highlands of Thibet, on the hills and plateaux of Western China and Sikkim, and in these regions rinderpest is met with.

The disease is generally considered to be enzootic on the Steppes of Russia, but it may be considered to have extended its habitat to the entire continent of Asia, for it is common in China, Asiatic Russia, India, Burmah, and Central Asia, and it is also met with in the continent of Africa.

Slaughter cattle purchased in the province of Shan Tung, south of Pechili, brought the disease to Pekin during the war (1900-01) and caused severe losses among slaughter cattle on the lines of communication and at Pekin.

This disease is one of grave importance by reason of its extremely virulent nature when it is first encountered. It very rapidly spreads through a herd, and the most approved method of dealing with it is to render animals immune by the preventive inoculation of a serum. Unfortunately there are times and occasions when you have to deal

with it and have not the serum at hand to help you. This was the case in China.

Another difficulty with regard to this disease is the practical impossibility to prevent, by any means available on active service, the contamination of healthy herds by diseased animals on the lines of communication of an army. Convoys are passing in a continuous stream, cattle are driven from post to post, and it can be readily understood how very easily herds are infected along this line. Frequently the men in charge of cattle are labourers or coolies of low intelligence, and who know little of the management of cattle, and care less; also the escort of these herds does not always hear of the orders issued until the damage is done, and it is often expedient to pass animals along as quickly as possible by any means available, road, river, or rail, regardless of precautions suggested for the prevention of disease. During the Sikkim-Thibet mission operations the bullocks were inoculated with a protective serum prepared at the Government Bacteriological Institute at Muktesar (India), with good results.

In South Africa the bullocks used in transport operations were subjected to a similar inoculation.

Epizootic Lymphangitis.

This disease has been brought into considerable prominence during the past six or seven years, and there are veterinarians in England who have not had any personal experience in dealing with it.

During operations in India, China, Thibet, and South Africa, to take the most recent wars as examples, it was frequently met with.

It will be necessary, before speaking of it in connection with an army in the field, to consider the disease itself rather more in detail than is necessary with most diseases, because it is not so generally well known as are others.

The causal organism of epizootic lymphangitis is the cryptococcus of rivolta, a saccharomyces; this organism flourishes in the lymphatic tracts and glands of the animal economy, gaining its entry through wounds.

By its presence, irritation of the invaded lymphatics is caused, abscess formation occurs along the lymphatic tracts and suppurating sores result in many situations. These sores follow the course of the lymphatics, and the appearances which result have been, and no doubt will continue to be, frequently confused with the lesions of glanders-farcy.

It will be more convenient to refer you to a text-book on the subject for a detailed description of the disorder, and we will now consider epizootic lymphangitis during warlike operations.

During the operations in China (1900-01) this disease was met with often, but it did not cause any widespread trouble or difficulty; cases were found, recognised and dealt with mainly by the destruction of infected animals, and no outbreak occurred.

In Somaliland, 1904, the disease was not prevalent; in Sikkim and Thibet it was met with and quickly controlled; and in South Africa it occurred during the recent war, but I imagine that it has given more

trouble since the cessation of operations than it did during their progress.

This disease does not incapacitate an animal until it becomes a confirmed case, or one in which structures are involved which interfere with the fitting of saddlery or harness; the majority of cases do not present any appearance to note until some time has elapsed, the wound originally infected will usually heal, and it may be three or more months afterwards that the organs become actively aggressive; it therefore is not a disease which will cause much disturbance in the plans for mounted operations in its initial stages.

Later on it is a different matter; in cases of some standing the appearances may resemble a confirmed case of farcy. I have seen infected horses with hind legs of enormous size. The lymphatic tracts in the inguinal region swollen to the size of one's arm, ulcers of varying size, extending from groin to foot. More frequently an insignificant abscess or two are seen on withers, or at the point of the shoulder, maybe around a stifle, or surrounding an eye; the peculiar thing is that they do not quickly heal; they persist, and others form in the neighbourhood until a formidable case is under treatment. I have met with two severe outbreaks due to castration. Colts are operated on, the wound heals, and they are sent to regiments, batteries, transport corps, &c., and some months afterwards, when with their unit, it is found that a crop of pustules has developed in the neighbourhood of the scrotal wound, and practically all the batch of colts operated upon at that time or place are found to be affected.

It will be noticed that this disease is one of somewhat prolonged incubation, and herein lies one of the chief difficulties in dealing with it, as it cannot be diagnosed until clinical symptoms appear.

Another feature which presents grave difficulties in its prophylaxis is the liability is to recurrence in cases of wounds after treatment, when the animal is apparently cured. This also leads up to the point as to whether it is advisable to place cases under treatment, or to stamp it out by the destruction of infected animals.

In war time, if cases can be diagnosed early, it is no doubt best to destroy and cremate them in order to diminish the number of centres of infection; during the stress of campaigns it is impossible to treat the disease with much success, but a very great deal may be accomplished if it be realised that in practice it only spreads from wound to wound. Even if the disease is present it is not impossible to keep wounds covered or protected and to avoid passing on the contagion by the hands or dressings of veterinary assistants or others employed in dressing wounds. It is difficult to ensure this extreme care.

The time comes after operations have ceased, when there is no necessity for the movement of troops, suspected animals can be placed under observation and the affected can be dealt with, but it is a work of years to finally obtain a clean bill of health. After a campaign this disease causes most mischief, when animals which have been through the various operations return to other countries, and may carry the contagion with them, and I need hardly say that this is a matter of very great importance, and one which is engaging the attention of many both inside and outside our profession.

Epizootic lymphangitis is known in many countries, it is found in Japan and the Far East; it has been enzootic in Burmah for years.

In India it is common; an undoubted outbreak is recorded in 1894 by Moore and Clarke, it is said to have been noticed in South Africa before the war, it certainly was there after the war, and many parts of Europe are known to be affected with it; to the last we must add Great Britain and Ireland.

"KUMRI" OR "WINDSTROKE."

This is the term given to a disease met with in campaigns in Eastern countries, and during the operations which culminated in the annexation of Upper Burmah it caused very great losses in horses of Indian cavalry. I can find no account of this disease having been met with in other countries. It used to be very prevalent in India both in the North and in the South, generally affecting the horse, although mules may also become affected, but cases are not so frequently met with in these animals.

I have seen it in the Deccan, and in the coastal districts both east and west in the Madras Presidency; in Malabar and Cochin it was very common in the eighties, but I did not meet with it so frequently during the next decade.

The name "Windstroke" is applied to it because it is held by the natives of India, and also by others, that the cause of the symptoms met with was a prevailing wind at certain seasons, generally a land wind which blows at regular intervals and at known hours and in a known direction.

The symptoms presented are those of paralysis, sometimes a paraplegia, often general paralysis with complete loss of control of limbs and movement, and later on complete paralysis. One generally notices a want of control of a hind limb or limbs as a first symptom, frequently the attack is sudden and the animal is found in the morning quite unable to control its limbs or head; if lifted into a standing position it is so helpless that it cannot maintain itself there, but limbs and spine are of indiarubber-like flaccidity.

At other times the attack is not so severe, and beyond a slight loss of muscular co-ordination there is not much to be seen.

The treatment of cases is of little avail; one imagines sometimes that improvement is occurring, but the majority of cases treated do not improve, and are destroyed sooner or later.

I am not aware that there is any recent literature bearing on this disease. I think that, judging from other animal disorders, it may be found that "Kumri" is a disease which will be referred to the class of disorders due to the presence of infusoria in the blood. It has been my fortune to meet with it frequently, and I have made a large number of *post-mortem* examinations, and on one occasion I sent sections of spinal cord to England for examination, with no illuminating results, for they were said to present no morbid features of any kind, and the sections I sent were taken from two pronounced cases of the disease.

I have never found any marked changes in spinal cords I have examined. It is said that in this disease one may find congested areas, increase of spinal fluid and degenerative changes, but I have not noticed these myself. I have a theory regarding "Kumri" but have never been able to substantiate it, and this is that it is due to "Filariasis."

To explain my reasons for holding this theory, I must say that I lived in South India for many years, and annually operated upon a large number of horses for filaria in the eye, and I have noticed a case of "kumri" complicated with filaria in the eye. I have also seen "kumri" follow in animals from which filaria have been removed from the eye. Subsequent to the disease being established I have removed filaria from the eye, and further I have found these filaria or nematode worms in cavities of the body, abdomen and scrotum in horses destroyed for "kumri," on *post-mortem* examination; but I have never found them in the spinal canal or cord.

It is possible that larval forms of this parasite may invade nerve centres and cause the symptoms we see, but I only say it is possible, because I have failed to get confirmatory evidence to prove the case.

The disease is confined, so far as I can find any evidence to guide me, principally to India and Burmah, in the coast districts of these countries where the annual monsoon rains are very heavy and vegetation luxuriant; it also is met with in the dryer areas of the Deccan and parts of Northern India.

As regards its importance in campaigns there is no doubt but that in these countries it is a terrible scourge. I have said it caused great losses in the Burmah campaign of 1886, one regiment of cavalry 500 strong having lost nearly all its horses from this cause alone.

The disease known as "mal de caderas" (literally, disease affecting the hind quarters) met with in South America, and which is caused by the invasion of the blood by the *Trypanosama equinum*, presents somewhat similar appearances to those noted in "kumri" in India, and it is highly probable that the latter is due to a similar cause, judging entirely from analogy.

"Surra" (Vernacular, Rotten.)

This formidable disease has caused considerable loss during war and afterwards in India, Burmah and adjacent countries, and is one of a class of diseases of vast interest and importance not only from the point of view of the practitioner and veterinary pathologist, but also to the bacteriologist and entomologist.

The causal organism of this disorder is a flagellated protozoa or trypanosome (first demonstrated by Dr. Evans, A.V.D.). The parasite is found in the blood free in the liquor sanguinis.

The disease was investigated by Steel in Burmah in 1884-1885, and an exhaustive treatise on surra has been published by Lingard comparatively recently. Surra is invariably fatal in equines, the disease usually running a protracted course with marked periods of intermission. The prominent symptoms are those of progressive anæmia.

In the camel, surra runs a more protracted course than it does in equines, and the presence of the parasite in the blood does not cause the same serious sequelæ in all cases.

Surra exists in numbers of camels on the frontier of India, in which it was not suspected, and an investigation on this matter was proceeding when I left India in 1904.

The Burmese campaign of 1884-5 was responsible for very con-

siderable loss from this disease in cavalry horses, transport ponies and mules, and the areas in that country within the limits of which surra may be expected are well known.

Surra is also common in North-Eastern India and Assam. The disease has been known from time immemorial in Central Asia (Lingard) and nearly all over India. In French Indo-China it caused the loss of many hundreds of camels in 1891-1894. In 1901 it was noticed among American army animals in the Philippines, taken there presumably by mules from the China expedition, which had subsequently been taken over to the Archipelago. (Nocard.) What mules these were I do not know, but they were not Indian army mules, as far as I can remember, for these were returned to India on the conclusion of operations in North China. However, it will serve to illustrate the transmissibility of the disease, for we had no cases of surra diagnosed as such in North China. I will refer to this point a little latter.

Surra is transmitted by biting insects, particularly, if not solely, by a dipterous fly, the *Tabanus tropica*. Nocard states that no stage of evolution of the parasite takes place in the fly: little is apparently known of the life history of the trypanosome; it possibly passes some phase of its existence in unsuspected hosts or in outside media.

Surra shows a preference for the horse, ass and mule; it is common in the camel, is found in the elephant, cat and dog. Cattle are not to susceptible, but are not immune. Imported animals are more susceptible than are indigenous ones.

One attack does not confer an immunity when the animal recovers. Lingard instances a case in which an animal succumbed to a second attack of the disease. Surra is nearly invariably fatal in equines, treatment being of little avail. Arsenic is recommended. Prevention is possible if the infective are known and can be avoided. It is obviously impossible to do this in an enemy's country.

The *Trypanosoma evansii* is similar to the *Trypanosoma lewisii* of rats (not pathogenic). Steel found the parasite in the blood of transport animals from Burmah (ponies) in 1885, and I saw it then with him at Poona (India).

Regarding the outbreak in the Philippines mentioned above, it is considered probable that animals, themselves tolerant of the disease, may pass it on to others and even to other countries. This will serve to indicate the enormous difficulties which beset the path of the legislator who would attempt to prevent its march.

Nagana, or Tsetse-fly Disease.

Nagana, n'gana or tsetse-fly disease is well known in Africa, and in many parts renders the breeding of domesticated animals impossible.

This disease is remarkably like surra, the difference being principally in the morphology of the trypanosome.

The causal organism is the *Trypanosoma Brucei* (demonstrated by Bruce in 1886), and this observer made clear the part played in the transmission of the disease by the tsetse-fly (*Glossina morsitans*), and the preservation of the virus in the system of wild animals. The

disease affects the same animals as does surra. Cattle are less susceptible than equines: man and birds are refractory.

It is found practically all over Africa, principally in low-lying districts, in the neighbourhood of lakes, the course of big rivers, and on the sea coast. The symptoms are similar to those of surra.

The tsetse fly, having bitten a nagana-infected animal, conveys a trace of blood to the next animal it bites, and transmits the contagion to it.

Flies carried from an infected locality to a healthy one carry the contagion with them, and they remain infective from twenty-four to forty-eight hours. No other fly carries the virus, and the geographical distribution of the fly and the disease correspond. (Nocard.)

Bruce's investigations have proved that the blood of wild animals is at times virulent, although no trypanosomes can be found in it, and it must be admitted that the blood of some of these animals is in a state of permanent infection. There can, in fact, be no doubt that it is from this blood that the fly obtains the germs of this disease, germs which are incapable of remaining more than forty-eight hours virulent in the fly, and which, nevertheless, are always prevalent in many districts of Central Africa.

It is probable that there is no immunity in these wild animals, but considerable tolerance of the parasite, which permits of the parasite living in the blood in small numbers without harm to the host. (Laveran and Mesnil).

The prevention of the disease is best attempted by the avoidance of the fly, and it is noticed that the disease and the fly are disappearing from areas coincident with the destruction of big game, such as wild ruminants.

Treatment is unsatisfactory, as in surra, arsenic appearing to have slight effect on the life of the parasite.

Nagana presented an insurmountable obstacle to the passage of convoys over infected areas, and I have therefore included it among diseases occurring during war.

We find that the flagellated hæmatozoons or trypanosomata are the causal organisms of surra, n'gana, dourine (which I have not considered in this paper) and mal de caderas, and it may safely be prophesied that the list of diseases of the group "trypanosomiasis," will certainly be added to by the discovery of other diseases due to these causes.

They are highly important to the army veterinarian, especially from their great range and their transmissibility. Cattle for surra and wild ruminants for n'gana serve as preservers of the virus, and in this manner the contagion is kept alive, and transmission becomes easy when the other necessary factors, namely, the special flies, are included.

Biliary Fever.

Biliary fever is a disease which has been cleared up during recent years, and is one which was met with largely among army horses during the South African war. It is also quite common in India, or if not common, it occurs there frequently, and no doubt many cases which are known as "bilious fever" are attributable to the same cause.

The disease comes under the heading of specific disorders, and is due to a parasite similar to the malarial parasite of man, and to the parasite found in Texas fever in cattle.

Four species of these parasites are known in Mammalia, namely, those affecting horses, cattle, sheep, and dogs (Nocard and Leclainche.)

These piro-plasmodia invade the blood and enter the red corpuscles, which they destroy, and the hæmoglobin becomes liberated. Anæmia, hæmoglobinuria and jaundice are the result of the parasitic invasion. The mortality from this disease is not very great, considering to what class the disease belongs; it is about 12 per cent.

Piroplasmosis is a tick-transmitted disease.

It is probable that the horses of the country are congenitally immune, as the disease occurs only sporadically among them, while imported horses are generally readily affected. During the South African war Argentine horses appeared to be peculiarly liable to the disease, while English, Australian and New Zealand animals showed this to a less degree, and the large American horses, brought over as artillery remounts, were never affected (Nocard and Leclainche).

The disease is usually transmitted during grazing; horses kept in stables are not so frequently affected; one attack is sufficient to ensure a lasting immunity. There is still a lot to be learned regarding this disease, and it is nearly certain that animals which have been attacked and have recovered, and show no symptoms of the disease or of illness, are capable of transmitting it to healthy animals.

Treatment depends on the symptoms met with. Quinine is considered of benefit when the parasites are present in the blood. Prevention of grazing in suspected areas and stabling at night are indicated as prophylactic measures.

Horse Sickness.

Horse sickness (African) is another disease met with during the late war in South Africa, and it is still found there. Many regard this disease and the piroplasmosis termed biliary fever as identical; others think otherwise. I am not aware that the organism supposed to exist and to cause this disease has been yet demonstrated. Horse sickness is undoubtedly a blood disorder, the type to which it belongs is not accurately known, certainly the parasite of biliary fever has been found in the blood of a horse dead from typical horse sickness (Bowhill).

The Government of the Transvaal are carrying out the immunisation of mules and horses at various stations in respect to this disease. The extent to which army horses suffered from this disease during the late war is not known with certainty, but in 1903 the deaths in the Transvaal from horse sickness in army horses amounted to 383; the following year showed 83 deaths, and fewer still in 1905.

The precautions necessary to prevent this disease consist largely in the provision of stabling and the prohibition of grazing at night in the districts in which it is prevalent.

Epizootic Aphtha, or Foot and Mouth Disease.

When a large proportion of transport animals on a campaign consists of bovines this disease is one to be reckoned with, for it causes a more or less complete breakdown in these animals when they become affected. It is also so extremely contagious that it spreads very rapidly and is difficult to control. Fortunately it is a

disease of a mild character, although occasionally considerable mortality will occur from its sequelæ.

Epizootic aphtha may be described as a specific contagious disorder, characterised by symptoms of a febrile nature, and accompanied by an eruption on mucous surfaces, generally on tongue and gums, and at the junction of hoof with skin and between the digits.

It is generally observed in ruminants but is not confined to them; horses, elephants and man may be affected.

There is a recorded instance of a disease simulating this during the American war between North and South, in 1860-63; before the battle of Manassas the Confederate cavalry were rendered useless in consequence of a disease which broke out among their horses which affected their mouths and feet ("Stonewall Jackson," Henderson).

As far as transport bullocks are concerned this disease causes great trouble, the principal losses occurring from suppurating coronets and loss of the hoof, generally the result, when it happens, of the wounds becoming fly-blown.

It is also to be dreaded among the herds of cattle maintained for slaughter or milk. A somewhat severe outbreak occurred during the China expedition among the slaughter cattle on the lines of communication, and at Pekin; there are records of this disease affecting cattle and elephants during the Afghan wars, and in the Indian frontier campaigns. I have no doubt that it was met with in South Africa during the late war.

Specific Ophthalmia.

Another disease met with during and after the South African war was specific ophthalmia. This disease is rather prevalent in army horses in South Africa, and also in mules—indigenous mules are apparently rarely affected. The disease is assumed to be due to a specific organism, but more investigation is necessary.

Diseases not Readily Communicable.

Tetanus is a disease which is common on active service. It does not occur as an epizootic, but it is met with in sufficiently frequent instances to merit inclusion among the diseases which are discussed in this paper.

Tetanus may be considered a disease nearly invariably fatal. If the animal's system is strongly impregnated with the toxins of the bacillus tetanus and the symptoms peculiar to the disorder are strongly in evidence, the chances of recovery are remote.

Considering this disease among animals in war time, we find the most frequent cases in transport animals, such as mules and ponies. This may be explained by the fact that they suffer from sore backs, galled withers and girthplace, treads and injuries to limbs and feet, and are generally in numerical superiority to other animals on a campaign; moreover, they are often housed in huts or dwellings vacated by human beings; being smaller than horses they can be closer packed than can larger animals, and shelters which are not suitable for horses can be utilised for them.

I have often thought that mules are more susceptible than are other animals to this disease; but I also think that the reasons just given

may account for the greater frequency of the disease among them on active service, and perhaps it is not a fact that they evince greater susceptibility than other animals. It is well known that the bacillus tetanus exists in abundance in the soil, and especially in the soil of the floors of human dwellings; this is particularly true of Eastern countries.

During the China war, after the conclusion of active operations, the transport mules and ponies of the British contingent were quartered in large numbers in the abandoned houses of Chinese in Pekin, which were converted into transport lines and stables during the winter, and from these stables the greatest number of cases of tetanus were admitted to treatment or were disposed of.

These cases were of such frequent occurrence that particular care was taken in the disinfection of wounds on these animals, in order to minimise the risk of infection.

Tetanus is not a freely communicable disease, and after a war there is no probability of it assuming epizootic proportions.

Lameness.

A short account only will be necessary of the common causes of lameness on active service, because, although the conditions may vary somewhat, yet the causes of the lameness are similar to those occurring in peace time.

I place Laminitis first on the list of lameness, as one meets with this cause of disability to work very frequently. When long marches are performed it is a very serious condition, for rest is very essential in the treatment of severe cases.

There are hundreds of cases met with which have to go on when suffering from the affection in its sub-acute form, and many of them are benefitted by work which is not too severe for them. Often these cases become chronic and are able to march day after day, and eventually the usual alteration in the foot occurs, the sole becomes pumiced, and they may or they may not be of service, this depending largely on the extent of the structural deformity.

The causes of laminitis are generally attributable to overwork, especially in hot weather, or long hours on the road in harness or under saddle. Acute cases are often best destroyed, so much depends on the facilities for treatment. If they can be treated it is worth while doing so, but if they have to be left without treatment, it is more merciful to put them out of their pain.

Sprained tendons and ligaments are comparatively infrequent in seasoned horses; they result from the ordinary causes, and are, as a rule, amenable to treatment.

Accidental punctures of feet are common, and are readily treated. The shoeing of horses on service is carried out with a certain amount of difficulty. The forge cart of mounted units is very heavy; the worst horses are often told off to take it along, and it is generally last in camp in consequence. Feet do not last unless carefully shod, and the old adage applies forcibly on service that "Where there is no foot there is no horse."

Other lamenesses do not call for special mention.

Sporadic Diseases.

Sporadic diseases met with are those seen daily in time of peace.

"Digestive" diseases are not frequent, horses do not usually get overfed on campaigns, they also get lots of regular work and so keep healthy in consequence. Colic naturally occurs at times, and usually yields to the ordinary treatment. "Respiratory" diseases are not common; open-air treatment suits the horse, and all through the severe winter in North China diseases of this class were infrequent. It is most astonishing to note the adaptability of horses to extremes of temperature; on board ship, in the tropics, horses are subjected to extreme trying heat, the same animals a few months later may be exposed to arctic conditious. These two extremes we noted in the China expedition, and I marvelled at the manner in which they were met. I think horses stand cold weather better than heat, but they will thrive under each condition when well cared for.

The same applies with even greater force to the mule, he is very hardy, and is the best transport animal in any country, always ready to feed or work, a great desideratum.

I should like to draw attention to a movement which is now on foot, and which is promulgated by the Church Society for promoting kindness to animals, for the purpose of extending the terms of the Geneva Convention so as to include "Animals" among its provisions, and so to extend its protection in time of war to those in attendance upon them when sick and injured. Apparently the greatest sympathy is shown to the proposal by the representatives of the powers, and I personally can see no objection to the desire for the inclusion of those working in the field for the welfare of army animals in the provisions of this Convention, and I hope it will soon be an accomplished fact.

In conclusion, I wish to say that I have tried to furnish material for discussion on diseases of animals in times of modern war. I was unfortunate in not being in South Africa during the late war, but I feel sure that many here can give their own experiences in that country, and that therefore my want in this respect will be fully atoned. My own experiences have been gained in India and the farther East, as you will have probably noticed.

I at one time intended to gather some information regarding animals in war time in the early part and middle of the last century, but after wading through many interesting books and being much edified by the perusal of the despatches of many fine soldiers, I came to the reluctant conclusion that "Tactics" should have been the heading of this paper if I was to continue this line of research, and so I have written what I have. Would it were worthier. My hope is that it will lead to a discussion of interest to the profession, and so I leave it.

ABSTRACT FROM THE NINTH ANNUAL CONGRESS OF THE AGRICULTURAL UNION OF CAPE COLONY.

Transit of Live Stock.

Dr. Hutcheon (Director of Agriculture) presented the following report on the Inter-Colonial Regulations relating to the Transit of Live Stock, Sheep and Goats between the various South African Colonies:—

Inter-Colonial Regulations Relating to Transit of Live Stock.

There is very little essential difference in the regulations relating to the movement of stock from one colony to another, with the exception of Rhodesia, and certain areas of the Transvaal which are affected with African Coast Fever.

SHEEP AND GOATS.

The Cape Colony admits sheep and goats from the Orange River Colony, Natal, the British Protectorate and the Transvaal, after being twice dipped, the second dipping to be within fourteen days of being introduced, and with regard to the Transvaal the second dipping requires to be in arsenical dip, with the object of destroying ticks. The *Orange River Colony* admits sheep and goats from Natal and Cape Colony, if accompanied by a clean certificate signed by the recognised authority. No small stock are yet admitted from the Transvaal, but regulations for their admission are being considered. *Natal* admits sheep and goats from the Orange River Colony without being dipped at the border, if dipped on arrival at their destination. From Cape Colony they are admitted through certain ports of entry on being dipped at the border. From the Transvaal sheep are admitted through certain ports if they are certified by a veterinary surgeon as being free from disease and have not come from an area affected with African Coast Fever, and that they have been dipped within a period of ten days, but if they come from an infected area they must be dipped at the border.

The Transvaal.—Sheep and goats are admitted on examination at the port of entry.

In Rhodesia.—Sheep are admitted if accompanied by a certificate that they are free from disease, and have not come from the districts of the Cape Colony and the Transvaal which are affected with Heart-Water.

CATTLE.

Transvaal.—Special permission is required to introduce cattle into the Transvaal, to obtain which, all particulars regarding destination and locality from which they come have to be supplied.

Orange River Colony admits cattle from Natal and Cape Colony if accompanied by a health certificate from the recognised authority. Cattle are not admitted from the other Colonies.

Natal admits cattle from the Orange River Colony and Cape Colony without restrictions. They are not admitted from the other Colonies.

Cape Colony.—Cattle are allowed to enter from Natal, the Orange River Colony and Basutoland, if accompanied by a health certificate. Cattle are admitted from the British Protectorate if accompanied by a health certificate and are dipped at the border. Cattle are not admitted from Rhodesia and the Transvaal.

PIGS.

Cape Colony.—Pigs are admitted from all the Colonies without a permit.

Natal admits pigs from Orange River Colony, Bechuanaland Pro-

tectorate, Transvaal and Basutoland without permit. They are not admitted from Cape Colony.

Orange River Colony admits pigs from Natal without a permit. From the Cape Colony importers require special permission to introduce them, and they must be accompanied by a special certificate from the Chief Veterinary Surgeon in addition to a certificate from the local authority.

Transvaal admits pigs from Cape Colony on the same conditions, no permit required for the admission of pigs from the other Colonies.

Rhodesia admits pigs from Natal without permit, but special permission is required to admit pigs from the other Colonies.

Dogs.

Cape Colony does not admit dogs, &c., from any Coast Ports North-East of Durban, nor from Rhodesia or the Bechuanaland Protectorate north of Palapye. But they are admitted if accompanied by the necessary health certificate from the other Colonies.

Transvaal prohibits the introduction of dogs from Rhodesia, but admits them without permit from the other Colonies.

Orange River Colony has similar regulations.

Natal does not admit dogs from Rhodesia but admits them from the other Colonies, if accompanied by a veterinary certificate of health.

Rhodesia.—Dogs are admitted, if accompanied by a veterinary certificate of health, but they must be registered at the nearest Police Station on arrival.

Equines.

The Transvaal.—Equines require to be accompanied by a veterinary certificate of health, and that they have been tested with mallein, indicating that they are free from glanders. Otherwise they will be detained and tested at the border. Exceptions: race horses and equines engaged in to and from transit.

Rhodesia.—Equines require to be accompanied by a veterinary certificate, and are accepted at Bulawayo, Salisbury and Umtali. But if destined for any intermediate Station special permission is required. All equines are tested with mallein on arrival.

Natal admits equines from Cape Colony, Orange River Colony, Transvaal, Bechuanaland Protectorate and Basutoland without restrictions. If from Swaziland or Portuguese territory they must be dipped or sprayed.

Orange River Colony.—Equines are admitted, if accompanied by the required certificate of health.

Cape Colony.—Equines are admitted without restrictions, except from Rhodesia. I think, however, that it is time that we imposed some restrictions.

Pharmacological Notes.

OBSERVATIONS ON ARECOLINE HYDROBROMATE.*

BY HOWARD J. WILKS, WATERTOWN, NEW YORK.

ARECOLINE is the alkaloid of areca nut. The nut has been for a long time in use as a remedy for tapeworms and other worms of the intestinal tract. The alkaloid has been employed as an active purgative in colic and laminitis. It is claimed that it is more active as a purgative than eserine or pilocarpine or both. It is also said to be a remedy for tapeworms and has been used for its effects upon the eye as a myotic. Before beginning a description of its properties, some references may be noted as to the characteristics of the drug.

United States Dispensatory. Areca nut, or betel nut as it is sometimes called, is the product of an East Indian tree belonging to the family of palms. The fruit, which is about the size and shape of a small egg, and of an orange colour, contains the nut embedded in a fibrous fleshy envelope, and invested with a brittle shell which adheres to the exterior flesh.

The betel nut of commerce is of a roundish conical shape, rather larger than a chestnut, externally of a deep brown, diversified with a fawn colour, iuternally brownish red, with whitish veins, very hard, of a feeble odour when broken and of an astringent taste. It abounds in tannin and also contains gallic acid, a fixed oil, gum, a little volatile oil, lignin and various saline substances.

E. Bombalon obtained from it a volatile alkaloid, resembling nicotine, which he named arecaine. It is left from an ethereal solution in the form of a colourless oily liquid, smelling like weak meat broth and having a strong alkaline reaction.

With tartaric, citric, hydriodic and salicylic acids it forms varnish-like salts, the salicylate having a tobacco-like odour. Its taste is, at first, imperceptible but later acrid. It increases the secretion of saliva, lessens the pulse and has a purgative action.

E. Jähns has found three alkaloids: Arecoline $C_8H_{13}NO_2$, identical with the arecaine of Bombalon, arecaine $C_7H_{11}NO_2 + H_2O$ which occurs in colourless crystals, permanent in the air, soluble in water, but not in absolute alcohol, chloroform, ether or benzol; thirdly, an alkaloid which exists in quantities too minute to analyse.

Jähns considered arecaine the active principle and pronounced it a powerful teniacide resembling pelletierine. It also resembles muscarine, but depresses both the heart and respiration; causes tetanic convulsions and increases peristalsis extraordinarily. It contracts the pupil.

Arecoline is a volatile oil, miscible in all proportions in water, alcohol, ether and chloroform, forms crystalline salts and is pronounced very toxic. It exists in the nut in the proportion of 0·1 per cent. The hydrobromate is the form in which it is used: The dose for the horse being one-half to one grain. It is a more powerful stimulant of the salivary glands than physostigma, and is especially used in colics in horses in the above doses, and for tapeworm in man in 1-15—1-10 grain doses. It is also used as a myotic. A 1 per cent.

* These pharmacological observations were made recently at the New York State Veterinary College in the Laboratory of Dr. Pierre A. Fish.

solution in the eye produces strong myosis. It has been pronounced superior to physostigma in glaucoma, though less enduring in effect.

E. Fröhner finds that it increases secretions and peristalsis, acting similarly to a combination of eserine and pilocarpine. The first passage from the intestines takes place in from one-fourth to one half hour after the injection. The laxative effect is followed by slight colicy symptoms. Large doses are diaphorectic. Poisonous doses bring about an irregular condition of the heart, lessen blood pressure and slows the heart. Five grains kill a horse. As a therapeutic agent he has employed it on account of its action, stability of preparation and cheapness. It has proven valuable in colic and laminitis.

Dr. W. L. Bell recommends its use in colic and laminitis. The treatment in laminitis consists of injecting one grain daily subcutaneously along with applications to the feet. He states that before using arecoline he could not get such good results, although the other parts of the treatment were as rigidly adhered to.

A Belgian veterinarian reports a series of cases of laminitis in which recovery took place very promptly. The animals were fully recovered, and put to work on an average of about six days.

I have experimented upon several dogs to ascertain the effects of the drug in different doses.

Case No. 1.—Fox terrier weighing 18 lbs. One half grain of arecoline hydrobromate was administered subcutaneously. In three minutes he was dull and weak. He leaned against the cage, then pitched headlong to the floor. He was thrown into convulsions at each attempt to move. In a short time he was quiet, lying upon his side; his breathing was irregular and his mouth was wide open. At times his breathing was laboured and difficult, then quiet as if in deep sleep. The pupils were dilated. The bowels moved in fifteen minutes and again in one and a half hours.

Case No. 2.—Weight about 25 lbs. The doses were given on alternate days, beginning with 1-20 grain. This had no effect except to accelerate the breathing. A dose of 1-10 grain produced salivation and passages from the bowels in one and a half hours. Upon giving a dose of 1 grain the bowels moved twice very copiously within eight minutes. The pupils were dilated. The animal was weak, depressed, breathing irregular, and he laid upon his side with legs extended. The following day the dog was as well as usual. Upon giving a dose of 2 grains, the fæces were passed in six minutes, also the urine. Another passage of fæces in five minutes. He was very weak and irritable. The pupils were dilated and he rested upon his side. There was a third passage of fæces in ten minutes. In one hour he was resting easily and took note of his surroundings. The next morning he was better, but would not eat. The bowels were still loose and blood was passed with the fæces. He gradually grew better for the following six days, when he had apparently recovered. Later he was given 3 grains with essentially the same symptoms as were secured with the former dose, except that they were more severe. He was injected at 2.30 p.m. and died the following morning at 9 a.m.

The *post mortem* showed: lungs normal; spleen slightly congested; stomach full of a dark green liquid. The small intestines were congested in areas half to two inches long. Cæcum congested. Liver,

pancreas and kidneys normal. Bladder congested. Auricles empty. Ventricles full of dark blood. The mucosa of the ileum was very much congested and showed a bloody exudate. The contents of the intestines were bloody. Seven tapeworms were found in the small intestines. This fact was interesting, since the dog had been repeatedly dosed with the drug, and in quantity sufficiently to purge and finally to kill, yet the worms had not been expelled.

Several kittens were used. Doses of $\frac{1}{8}$ to $\frac{1}{2}$ grain proved toxic with the following symptoms: Fæces in about three minutes. Signs of illusions. Ran about cage with tail bristled and spitting at imaginary objects. Very irritable. Pupils dilated. Lying upon its side in eight to ten minutes. Soon the respirations ceased but the heart did not stop until one or two minutes later. A dose of $\frac{1}{16}$ grain produced no symptoms in a cat of 5 or 6 pounds.

To test the keeping qualities of the solution, $\frac{1}{8}$th grain that had been in solution for two weeks was injected. This seemed as powerful as a fresh solution, killing the cat in a few minutes and with the usual symptoms.

In a dog under chloroform anæsthesia, $\frac{1}{12}$th grain was injected into a loop of the intestine and the loop ligated at either end. An adjacent loop was kept as a control. In three quarters of an hour the different segments were examined. The segment receiving the arecoline appeared harder and firmer than the control. Upon cutting open both segments, congestion was found in the one containing the arecoline but not in the other. No difference in the amount of secretion could be noticed. Salivation did not occur. In each segment living tapeworms were found.

To try the effect of the drug upon the heart, experiments were performed upon the horse and frog. In the case of the former, intravenous injections were used and a blood pressure tracing taken. In each case a very rapid fall in blood pressure was obtained. In the case of the frog a minim of the solution was dropped upon the heart. It was found that 1 per cent. would stop the heart within one beat and more permanently than stimulation of the vagus. Solutions of 0·1 per cent. acted nearly as strong as the 1 per cent. If a drop of strychnine or atropine solution were applied before the arecoline, the action of the drug was not very marked.

As a curative agent, I have not had much opportunity for experiments. In one case of impaction colic in a mare possessing an enormous ventral hernia, I gave $\frac{1}{2}$ grain and secured no action other than salivation. Half an hour later $\frac{3}{4}$ grain was given and a copious discharge was secured from the bowels in about twenty minutes.

The salivation was very marked. In about ten minutes the animal opened its mouth and a mouthful of saliva fell out. The saliva kept dropping for about fifteen or twenty minutes. During the action of the drug the animal was quite restless and colicy.

In one stable in which laminitis occurred at the same time, arecoline was given to two horses and an aloes ball to the third; in other respects the treatment was the same. The two receiving the arecoline were worked on the second day and were examined in the evening. They were found entirely recovered. The third case also worked on the second day but was pretty sore at the time of examination.

The following conclusions as to the action and uses of arecoline may

be drawn from the preceding experiments and the literature upon the subject; that it is a rapid intestinal evacuant, increasing both peristalsis and the secretions. That its action is accompanied by colicy symptoms and profuse salivation. That its action upon the eye is two-fold, locally it is a myotic and internally a mydriatic. That the chief dangers in its use are on account of its action upon the heart and respiration.

Indications for its use are in cases of colic, laminitis or wherever a rapid evacuant is desired.

That as a remedy for worms, especially as a teniacide, it cannot be relied upon from the facts that solutions of it have failed to expel the worms when given in doses sufficient to produce purgation and finally to kill the dog, nor did the solution kill the worms applied to them directly, as in the case where the bowel was ligated.

Its chief advantages over eserine and pilocarpine are that it is more permanent in solution, and is cheaper, especially if purchased in bulk.

Reviews.

THE LAW RELATING TO THE PREVENTION OF CRUELTY TO ANIMALS. By Percy M. Burton, of the Inner Temple and the Midland Circuit, Barrister at Law; and Guy H. Guillum Scott, of the Inner Temple and the South-Eastern Circuit, Barrister at Law. Published by John Murray, Albemarle Street, London. 170 pages.

The authors have confined themselves strictly to the legal point of what does and what does not constitute cruelty to animals, avoiding any humanitarian or moral discussion, and as far as possible they quote decided cases or judicial opinion, which have been expressed from the bench.

The law relating to cruelty to animals, unlike the great mass of English common law of modern origin, dates from the passing of Martin's Act in 1822, which is the foundation of the subject and on which the subsequent Acts now in force have been built up. These various statutes are given section by section and commented upon and explained in a clear and lucid manner.

The principal Act of 1849 is quoted at length, also sections from certain others that have a bearing on the subject, such as the Larceny Act of 1861, and Poisoned Grain Prohibition Act, 1863. There are also extracts from a number of the *Archives* of the Board of Agriculture, such as the Rabies Order of 1847 and Importation of Dogs Order of 1900, set out in a handy form.

Chapter XI. contains a few notes in a concise form on evidence and procedure which are worth careful study, and being written in simple terms, are within the comprehension of any layman. There is a copious index of the contents and of cited cases, with references, also an explanation of the abbreviations that are usually found in law books of the reports in which cases are to be found.

Messrs. Burton and Scott's book is one that not only should be found in every magistrate's and police court, but on the book shelf of every veterinary surgeon who practises in a town or city. This little volume we would confidently recommend to every practitioner

who is likely to be called on to give evidence in a cruelty case, and if its pages were carefully studied, we think that we would be spared a good many of those distressing exhibitions which are, alas, only too common, and which reflect but little credit on either the parties concerned or the veterinary profession as a whole.

A Manual of Veterinary Therapeutics and Pharmacology. By E. Wallis Hoare, F.R.C.V.S. Second Edition, 779 pages, price 15s. Published by Baillière, Tindall and Cox, London.

The book which Mr. Wallis Hoare has now placed before the profession is distinctly original, and is as unlike its predecessor as it is possible for any one thing to be unlike another. As the author states in his preface, it has been entirely rewritten, and we almost venture to think that in altering the text the author would also have done well to have enlarged upon and altered the title of his work. The present manual of "Veterinary Therapeutics and Pharmacology," might almost more aptly have been termed "A Text-book of Veterinary Medicine." Certainly, with a few additions it would have merited the title and have taken its place amongst the standard text-books. When one reads such chapter headings as "The Treatment of the Diseases of the Digestive Organs," "The Treatment of the Diseases of the Urinary Organs," "of the Nervous System," "of the Organs of Respiration," "of the Heart," and ultimately, of such special affections as Influenza, Distemper, Purpura, Canine Typhus, and even Sarcoptic Mange, a reviewer must feel quite justified in expressing the above opinion.

Perhaps the author may take the suggestion for a future edition, and get the collaboration of those who have made a special study of other fields of veterinary medicine, with a view to making a more complete work on these lines.

His collaborator, Mr. Henry Gray, is to be congratulated on the amount of work with which he has aided the author, as it is quite apparent that numerous chapters have come from this gentleman's pen.

It is certainly a book from which the practitioner may pick up numerous ideas, and the prescriptions form a handy compendium for useful and speedy reference; in fact the whole work is full of information.

The publishers have done their work well, and the printing and binding are in their usual good style.

The Tropical Agriculturist, and Magazine of the Ceylon Agricultural Society. June, 1906. Published by A. M. and J. Ferguson, Colombo.

The June number of the Journal contains a number of articles which are mainly of practical interest to those who pursue Agriculture in Ceylon and other tropical countries.

There are articles on the cultivation of the rubber tree, on the tomato, on certain facts in connection with the cultivation of tea, of the silk-worm, and some interesting illustrations and photographs demonstrating the botanical characters of certain plants indigenous to Ceylon.

THE RHODESIAN AGRICULTURAL JOURNAL, June, 1906. Printed by the Cape Times, Ltd., Cape Town.

The Journal has always a number of articles relating to agricultural topics in Rhodesia, and it enters particularly into the best methods producing good crops of various saleable products, and the treatment of diseases to which stock is subject in this country.

ANNUAL REPORT OF THE BOARD OF AGRICULTURE AND FISHERIES, FOR THE YEAR 1905. Published by Wyman and Sons, Ltd. Fetter Lane, E.C. Price 1s.

The report of the Board of Agriculture is, as usual, divided into two sections, viz., that of the Chief Veterinary Officer and that of the Assistant Secretary of the Animals' Division. In many points the reports bears a similarity, and it is very satisfactory to note that distinct progress is being made in regard to the eradication of the animal diseases of Great Britain.

Swine fever, for example, shows a marked decrease in the number of outbreaks, there being only 817 during 1905, as compared with 1,196 in 1904. Attention is drawn to the fact that the diminution in the prevalence of this disease has been continuous for four years in succession.

Anthrax, sheep scab, and even glanders, have given less trouble this year than in 1904, and in regard to the latter disease, there is at last a prospect that the Board of Agriculture has determined to thoroughly take up the eradication of this disease in earnest. They are now waiting for the consent of the Treasury to supply the necessary funds, and it is to be hoped that these will be granted at the end of the present year.

Epizootic lymphangitis has been practically confined to the army, and both in military and civilian stables the disease may truly be said to be well under control.

Rabies and foot and mouth disease are non-existent in Great Britain, and so long as the present stringent quarantine regulations are maintained, even if a fresh outbreak of either of these diseases occurred, it could not maintain a footing.

The report is most excellent reading and should find a place on the book-shelf of every practising veterinary surgeon.

AGRICULTURAL JOURNAL OF THE CAPE OF GOOD HOPE. Volume xxviii. January to June, 1906. Published by the Department of Agriculture, Cape Town.

This number contains a large amount of matter which is mainly of interest to agricultural readers. The only specific points of interest to the veterinary world are a very fine photograph of a dipping-tank which has been fitted up for the eradication of ticks on cattle, and a resolution which was unanimously passed at the Ninth Annual Congress of the Agricultural Union of Cape Colony, recommending the erection of a public abattoir, so that cattle could be slaughtered and colonial meat shipped, or kept for distribution.

PAMPHLETS ON ANIMAL PARASITES AND OTHER SUBJECTS. Issued by the United States Department of Agriculture from the Bureau of Animal Industry. Washington.

We have received a large number of pamphlets on various subjects

connected with animals, being the published work of the year of those who are devoting their time to research under the auspices of the Bureau of Animal Industry. The pamphlets show most praiseworthy perseverance on the part of the workers. The following are the principal titles: "The Gid Parasite in American Sheep," by B. H. Ransom, B.Sc. "The External Parasites of Hogs," by Earle Stephenson, B.Sc. "Necrotic Stomatitis in Calves and Pigs," by John R. Mohler, A.M., V.M.D., and George B. Morse, M.D., V.S. "Texas Fever," by John R. Mohler, V.M.D. "The Life History of the Twisted Wire-worm of Sheep and other Ruminants," by B. H. Ransom, B.Sc.

The Bureau of Animal History does a splendid work in encouraging research and disseminating knowledge amongst the agricultural population and veterinary profession of America.

New Instruments and Appliances.

THE WARD FINNEMORE BAYONET NEEDLES.

It is almost impossible to force the ordinary suture needle through the thick, tough skin of some animals without a needle-holder, and this is not always satisfactory. There is no need for a needle-holder with these needles. By placing the thumb in the bend of the needle, and

the forefinger around it, it is surprising what force can be used and how easily they pass through the toughest of skins. I have given them a long and severe trial, and they have proved such an advantage that I rarely use any other shaped needle.

The makers are Messrs. Arnold and Sons, London.

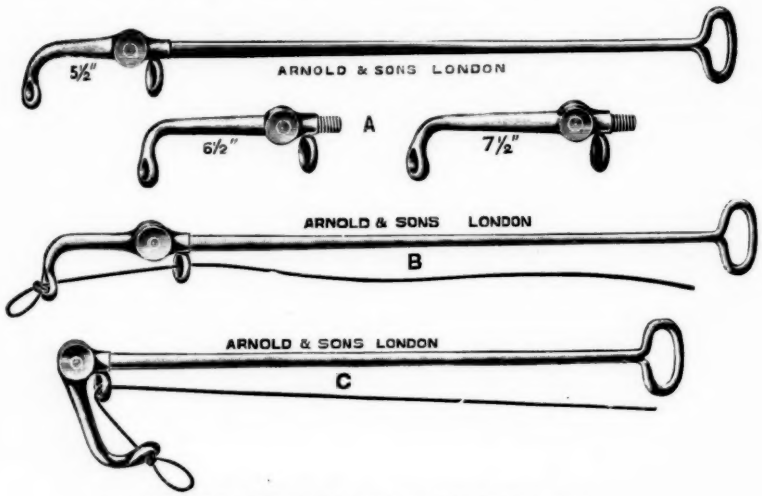
C. Ward Finnemore.

HINGED PORTE CORD.

Probably one of the most difficult cases of mal-presentation in the mare and cow to which we are called, is that in which "an anterior" presentation occurs. The feet may or may not be presented, and the head is turned so far back that it cannot be reached, and only the chest and neck can be felt.

It frequently happens that the head and neck are so close to the body that the cord cannot be passed between them in the usual way, the cord doubling up on itself, and cannot be reached from underneath.

In such a case, instead of resorting to embryotomy, I thread a cord through the eyes of the porte-cord, as per illustration, pass the carrier over the neck of the fœtus until the second eye is at the back of the neck; make sure that the hinged part is in a position to pass between head and body, then get someone to pull steadily on the cord, until I can hook my finger into the loop of the cord underneath the neck.



A. Hinged Porte Cord with interchangeable heads (3 sizes).
B. Fitted and threaded with calving rope.
C. Same drawn tight as in use.

I draw the loop outside, withdraw the instrument and make the cord fast in the usual way by threading it through the loop, then by repelling the body and working the rope towards the head, the head can usually be brought into the passage and delivery effected.

The makers are Messrs. Arnold and Sons, London.

C. Ward Finnemore.

Personal.

Major H. T. Pease, F.R.C.V.S., of the Indian Civil Veterinary Department, the Principal of Lahore Veterinary College, India, has recently been elected a foreign corresponding member of the Veterinary Medical Society of Paris.

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Mr. John Brown, M.R.C.V.S., was awarded the Diploma in Veterinary State Medicine of the Victoria University at the recent examination.

COLONEL NUNN, C.B., C.I.E., D.S.O., has assumed charge as Principal Veterinary Officer in India, and Colonel Blenkinsop, D.S.O., has taken over the command in South Africa.

AT the Preliminary Examination in Veterinary Science for the B.Sc. degree of the University of London, Mr. Leonard Thompson, of the Royal Veterinary College and the University Tutorial College, London, presented himself and passed satisfactorily. Messrs. William H. Andrews and H. T. Hughes passed Part I. of the Intermediate Examination for the same degree.

LIEUTENANT E. C. RUSSELL, Army Veterinary Corps, has been deputed to attend a course of instruction at the Bacteriological Laboratory at Muktesar.

A MONUMENT has recently been erected in the Berlin Veterinary School to the memory of Professor Dieckerhoff, as the result of private subscriptions. The ceremony of unveiling it took place recently in the presence of the Under Secretary of State for Agriculture, and a number of distinguished officials. The monument is a column of red granite supporting a life-like bust of the late distinguished Professor.

Translations and Extracts.

RUPTURE OF THE FLEXOR METATARSI IN A PONY.

BY M. VERLINDA, ANTWERP.

THE patient was a twelve-year-old pony. On May 12 he slipped with the near hind-leg on a tramway, the limb being forcibly extended. There was great lameness, the pony going on three legs, and he was brought back to the stable with difficulty.

He was seen the next day by the author, when he was standing and putting his weight on the leg without any inconvenience. At a walk he moved the leg slowly and carefully, and when the leg was raised, from the hock downwards it was inert, swinging about as if fractured at the hock. There was no flexion below the hock, the part being kept stiff in a line parallel with the tibia, the hamstring being loose and flaccid. The foot was put down fairly well, but somewhat further back than normal, and occasionally the toe was dragged along the ground. At rest the horse stood square, and when the off hind was raised the weight was taken without difficulty on the near hind.

Rupture of the flexor metatarsi tendon close to its insertion was diagnosed.

The only treatment was a mild blister to the part, followed by a little exercise in hand. In five weeks the patient was cured. There was slight loss of power of flexion that improved, but there was no lameness at either a walk or trot. Close to the lower part of the hock at the anterior part there was a small round nodule, the point of union of the ruptured ends of the tendons.

The author within the past six months has seen a similar case in a

nine-year-old cart mare. The animal was difficult to shoe, and she had to be put in the stocks, the near hind-feet being raised up. The violent struggles the mare made ruptured the tendon. A cure was effected in about five to six weeks. The author considers the injury not to be severe, although at first sight it is alarming. He has had five cases altogether, all of which recovered in five to six weeks.

(*L'Echo Vétérinaire.*)

CASE OF POISONING BY AMMONIA FUMES.

BY M. VERLINDE, ANTWERP.

THE case occurred in two horses that were drawing a dray on which some steel drums of liquid ammonia were loaded, when by accident one fell off and was smashed, exploding with a loud report like a cannon. Both horses and the driver were thrown to the ground by the explosion, and for some minutes lay stunned, the fumes of the ammonia preventing anyone approaching to render assistance. As soon as possible the horses were got on their feet and brought back to the stable, where they were seen by the author.

As is well known, ammonia is most irritating, and it is easy to imagine what the effect would be on an animal that had been breathing for several minutes what was practically a caustic atmosphere. The mucous membrane of the eyes, nostrils, and the cornea were in a measure cauterised. The epithelium of the tongue, gums, and palate were exfoliating in large flakes, leaving a raw and inflamed surface from which blood exuded.

There was a blood-stained discharge from both nostrils, which were partly obstructed by the œdamatous swelling of the mucous membrane, and the respirations were laboured and panting. The eyelids were greatly swollen, and the eyes closed with a great flow of tears. When opened, the corneæ was seen to be white and eroded.

The animals were fed on milk, and the local symptoms treated in the usual manner; a favourable diagnosis was given, and it was expected that both would be at work again in about a fortnight.

The first few days after the accident both patients were very dull, depressed, and feverish; pulse 60, respiration 26, temperature 39° to 39·8° C., and loss of appetite. There was intense photophobia keratitis and muco-purulent conjunctivitis, with a profuse yellow muco-purulent discharge mixed with flakes of epithelium from both nostrils. There was a frequent short, painful cough, and on examination of the chest there were noticed to be loud sibilant râles and dull patches, pointing to bronchitis, congestion, and pulmonary œdema.

On the third day the appetite in one case improved, the cornea cleared up from behind forward, so that the pupil became visible, and the horse could see. The flow of tears diminished, but the muco-purulent discharge continued.

The symptoms gradually subsided, and about the twelfth day the animal was convalescent, but the lung complications lasted for some time.

The second case, on the contrary, gradually became worse, with the exception of the eyes, broncho-pneumonia and septicæmia setting

in; and, as the case was hopeless, the animal was destroyed on the tenth day.

On *post-mortem* examination, patches of purulent broncho-pneumonia were present, the bronchi were of a greyish colour, the smaller bronchi were filled with muco-purulent casts containing the *debris* of the mucous membrane. The lower borders of the lungs in particular were implicated.

The lessons of this case is that in cases in which animals are injured by the inspiration of irritant or caustic vapours or smoke, the prognosis should be very guarded, as purulent broncho or gangrenous pneumonia are always to be feared.

(*L'Echo Vétérinaire.*)

TUBERCULOSIS OF THE MALE GENITAL ORGANS IN THE OX.

BY M. JEAN KOWALEWSKY, DIRECTOR OF THE TACHKENT ABATTOIR, RUSSIAN TURKESTAN.

TUBERCULOSIS of the genital organs would appear to be uncommon in the ox, as, according to the statistics of the German abattoirs, in the testicle it only amounts to 0·01 per cent., and out of 74,381 animals killed in the Moscow abattoirs between the years 1895 and 1899 there was not a single one reported (E. Gaillard, "Compte rendu du Service d'inspection Vétérinaire de l'abattoir de Moscow pour les anaées, 1888-90," pp. 69 and 70). At Stawropol, out of 800 cases of tuberculosis seen in four years and a half there were two cases of the disease in the genital organs.

According to Nocard ("Les Tuberculoses Animales," p. 28), tuberculosis of the genital organs is very uncommon, and is characterised by fibrous nodules, varying in size from an almond to a hazel nut, or by small yellow miliary tubercles that become softened and calcified. Friedberger and Frohner ("Pathologie et therapeutique speciales," Russian edition, 1901, vol. ii., p. 176) mentions the possibility of the testicle and its tunics being implicated. In their work on microbian diseases Nocard and Leclainche give a list of reported cases, amongst others one by Professor Frank, of tuberculosis of the penis; by Moule, of the testicle and spermatic cord; Perroncito, of tubercular orchitis and implication of the mucous membrane of the penis; Eber, of the testicle, cord and tunica vaginalis; Krautheim, of the penis and prepuce; and Fravenholtz, of the prostate gland.

The author gives two cases that came under his notice:—

CASE 1.—August 9, 1902. Tuberculosis of the testicles in an eight-year-old steppe bull in good condition.

The testicle was 11 centimetres long by 17 in diameter, and weighed 210 grammes; the surface was nodulated and the vessels dilated. The tunica vaginalis was very thickened, forming a fibrous shell from 2 to 3 mm. in thickness, the gland being transformed into a yellowish-grey fibrous mass. The external iliac gland was infiltrated, but not greatly altered. There was no trace of tuberculosis in any of the other tissues or organs.

On bacteriological examination, a few bacilli were found in the

pulp of the testicle, and it is reasonable to suppose that the case was one of primary tubercular orchitis.

Case 2.—On July 19, 1903, an ox that had been castrated by bistourage was noticed to have a tumour in the scrotum, with enlargement of the inguinal glands on the right side. On incision of the scrotum, about 150 cc. of yellowish-white pus mixed with serum escaped, with a quantity of flakes of caseous matter. The atrophied testicles, however, were free from disease.

The external surface of the scrotum was studded over with nodules, varying in size from a grain of wheat to a pea, consisting of a connective tissue shell containing a cheesy material which escaped on pressure. These nodules, about twenty to twenty-five in number, were united into four to six separate masses, and penetrated to the dartos muscle and neighbouring structures.

The enlarged inguinal glands were infiltrated with a caseous material and studded over with miliary nodules in the cuticular portion. The scrotum, dartos, and tunica vaginalis were hypertrophied, the spermatic cord being 3½ centimetres in diameter, and infiltrated with a soft grey material.

The scrotal fluid and scrapings from a section of one of the inguinal glands contained typical tubercle bacilli, but the viscera were healthy.

This case also was no doubt one of primary infection, the disease being localised at the point of infection.

(*Revue Générale de Médecine Vétérinaire.*)

OUTBREAK OF INFECTIOUS PARAPLEGIA.

BY PASTRIOT.

The outbreak took place on February 13, 1902, amongst the horses of the 6th Cuirassiers, quartered at Sainte Menehould. The first case was a mare of the 3rd squadron, who suddenly fell down in the barrack-square during a parade; the second case was on February 14, and the third on the 15th. Previously to this the horses had been perfectly healthy.

On March 3, 6, and 12 there were three fresh cases in the same squadron. On April 2 in the 2nd, and April 6 in the 4th squadron. The first squadron remained free.

Up to June 10 there were sixteen cases, of which eight were cured, one cast and sold, and seven died. On October 7 a horse of the 3rd squadron was sent to the depot, where he was attacked with paraplegia on November 25, that is, one hundred and sixty-eight days after the appearance of the last case at Sainte Menehould.

There were two forms observed—one acute, which came on without any premonitory symptoms; the other subacute, in which at first only one limb was affected. The temperature was 37·5° C., the tail flaccid, the penis hanging from the sheath, and the vulva half opened or œdematous. The urine was usually thick and yellow in colour, frequently voided, sometimes in a continuous dribble. Out of eight cases that fell down, seven died between the first and fifth days.

Animals of all ages were attacked. Out of seventeen cases, seven were horses, ten mares, of which one horse and six mares died.

As soon as the horses were picketed outside the disease disappeared, but again came on when the stables were reoccupied.

The hind quarter only was affected, the muscles were discoloured; there was a small quantity of urine in the bladder, the walls of which were thickened and infiltrated with a number of patches of ecchymosis, circular in shape and almost black, studded over it.

(*Recueil d'Hygiene et de Medecine Vétérinaires Militaires.*)

THE CLINICAL ASPECT OF POSITION IN VETERINARY PATHOLOGY.

BY M. PAUL HAAN, ASSISTANT VETERINARY SURGEON, 2ND DRAGOONS.

DEFECTS in position have been mentioned in all works on the exterior of the horse, and shoeing, but only superficially, and very little attention has been paid to the study of the cause. These defects are usually divided into two classes—congenital and acquired. It is only the second group that the author touches upon.

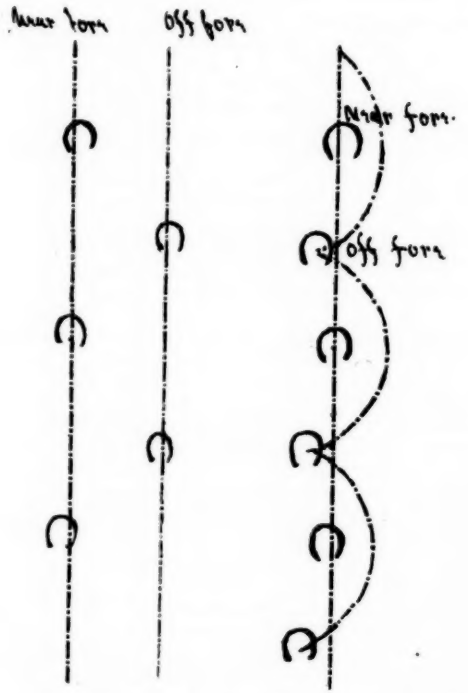
For a long time past abnormal postures have been recognised as symptoms of various diseases. These may entirely disappear on recovery, or may become chronic; for instance, one of the chief symptoms of laminitis is going on the heels with the limb pointed forwards.

It is only lately, however, that by the systematic study of diseases due to over-exertion of the bones of the limbs, it has been demonstrated that very often a false position is due to them and pain, as well as difficulty in moving. M. Joly calls attention to this, and says "when a young horse gets lame during breaking from *osteitis of fatigue*, there is usually defective position, which may develop suddenly or gradually."

MM. Jacoulet and Joly have shown the degree to which anchylosis with osteo-arthritis of the hocks will cause false position in even very young foals, quite independent of any hereditary deformity. MM. Huret and Barrier (*Bulletin de la Societe Centrale*, 1904, p. 477) show the important part pain plays in temporary or permanent alteration of position; but the question of the cause and effect of such alteration has attracted but little attention. The matter is a most complicated one, and the author confines his remarks to considering the conditions under which the horse alters his posture, and if this can be subjected to any general rule.

The chief factor to be considered is pain. M. Sanaud (*Revue Générale*, 1905, vol. v., p. 361), has endeavoured to determine how pain alters the rhythm of motion in the injured limb, and the author makes a somewhat analogous study, showing how certain lesions cause alteration in the position of the limbs. When a horse receives an injury to one of the limbs that causes pain he goes lame, and this lameness gives rise to alterations in the movements of the limbs, and it is common knowledge that these abnormal movements are the chief symptoms that guide us in the diagnosis of lameness, and that what applies to a whole limb may apply to a particular region.

It can readily be understood that if a particular part is painful, the animal will not only refrain from executing a movement that will increase the pain, but will endeavour to alleviate it, so that violent concussion with the ground, and even slight compression of the injured part, is carefully avoided, and the correct interpretation of this endeavour to obtain relief is the chief guide to diagnosis in a large number of diseases both in men and animals. In the horse this particularly applies in cases of lameness connected with the levers that move the machine, *i.e.*, the bones, and the organs that support it, the feet—the Hangbeinlahmheit and Stützbeinlahmheit of the German school.



Trace of fore feet of a sound horse.

Trace of fore feet of horse lame on near fore from corn on inner heel.

The patient strives to minimise the pain, and instinctively adopts the position that will afford him most relief. This is shown in the case of arthritis or synovitis, where the limb is carried in the position that gives the least amount of tension, and consequently is the easiest. In laminitis the weight is put on the heels to relieve the toe; and in gathered nails in the frog or heel on the toe. This adoption of position has been demonstrated by the author in a horse that had a

bad corn on the inner heel of the off fore foot, and of whose paces he took a tracing, which shows that to relieve himself all the weight was thrown on the outside of the lame foot, and that instead of being carried parallel to the rear, it was actually swung across it, as shown in the diagram. These facts are also illustrated by the way horses have of walking on one side or other of the road if they are given the choice, so as to adapt their limbs to the curve of the road-bed.

These alterations in the position of the limbs rapidly causes malformation of the bones, especially in young animals, and these in their turn are features in causing osteitis, both rarefied and deformative. (Siedamgrotzky, *Archiv. für Wissentschaftüliche und praktische Thierheilkunde*, Band *xvli.*, Heft 3, 1891).

Whatever the cause is, abnormal position shows that the lesion is of some standing, as there is a particular one assumed in each case. Thus in lesions of the hock the point of the calcis may approach or recede from the median line, and may incline inwards or outwards. This primary deformity may of itself cause pain, and induce another position to be taken up, so that in the same limb there may be a variety of postures, one compensating the other.

According to M. Joly, the most common deformity is the following: "The horse is stag-kneed and the toes are turned out, the bulb of the fetlocks approach each other; the internal quarter of the foot is lower than the outer, and the heels are contracted. The median line of the fetlock-joint and the sole of the foot no longer coincide, the deviation being from the inside. This deviation is indicative of the osteitis of overwork in the extremities, with splints, ring-bone, &c., which are more or less defined symptoms of osteitis of the third phalanx."

It is a common mistake to think that defects in position are confined to the lame or injured limb only; this is not the case, as they are sometimes seen in the sound ones.

A case is mentioned by the author of a horse that had had windgalls on the near hind, for which he was treated by injecting iodine. The near hind was abducted on account of the pain, and the off hind adducted so as to support the weight of the body.

The different lesions are divided by the author into four groups, viz., (1) tendons, (2) bones, (3) synovial membranes, (4) the feet.

(1) *Tendons.*—Defects in position from lesions of the tendons can be divided into two classes: (*a*) Temporary, in which, on subsidence of the cause the normal posture is resumed; (*b*) those in which the deformity is permanent.

An instance is given of a horse that sustained a severe sprain of both fore back tendons, and in a few days became excessively pigeon-toed. The animal was fired and given a run at grass. Six months later the feet had assumed their normal position. Permanent deformity is almost always due to sprain of the perforatus tendon, and almost always results in pigeon-toes.

(2) *Bones.*—Lesions of bone vary in both cause and effect; they generally, however, give rise to turning in of the toes. Out of twelve cases of splint, in three the toes were turned in, and in nine out. Ring-bone is usually accompanied with pigeon toes, while in contracted heels they turn in. Splints cause the pasterns to turn out and the toes in.

A case is mentioned of a hunter that threw out two large splints

and whose toes turned in, and M. Joly has seen the same in thoroughbred mares in injuries to the fetlock and knee-joints. The author has seen the same in three cases of fracture of the small metacarpal bone from a blow.

(3) *Joints.*—There is naturally a good deal of difficulty in determining if deformity is caused by a lesion of a joint, as such are usually accompanied by some disease or injury of bone or tendon, and it is hard to say which is the cause. In order to avoid confusion, observations have been made on cases of synovitis following on pneumonia, as such are most likely to be uncomplicated. In most of them the sessamoidean, carpal and tarsal sheaths were affected. In one case a four-year-old thoroughbred mare had five attacks of synovitis of the sessamoidean sheaths after recovery from pneumonia in January, 1904. Both fore toes turned out, but the off one improved in about five months, whereas the near remained deformed. A second case, a six-year-old thoroughbred mare, contracted synovitis of the hock-joint from the same cause, and the toes turned out.

(4) *Feet.*—Every practitioner is aware of the malformations that result from laminitis and canker, and a case is mentioned of the latter disease in the off hind foot in which the toes were turned out. In sand-cracks the toes are turned in if they are severe.

These observations appear to show that when the cause is on the inside of the limb the toes turn in, and when on the outside the horse becomes pigeon-toed, and the following conclusions are arrived at:—

(1) The horse stands in the position which is most easy.

(2) Pain is the initial cause.

(3) Deformities may be consecutive or compensating.

(4) Deformity of one limb may cause the same on the opposite side.

(5) Sprains of tendons and synovitis more often cause pigeon toes than the reverse.

(6) Osteitis, at all events in its earlier stages, generally causes the toes to turn in.

(7) Causes on the inner part of the limb generally cause the toes to turn in, causes on the outer to turn out. In the earlier stages osteitis on the inner aspect of the cannon bone, and external at the lower part, causes turned-in toes.

(8) Certain abnormal positions are hereditary.

(*Revue Générale de Médecine Vétérinaire.*)

THE POWERS OF RESISTANCE TO HEAT BY THE BACILLUS TUBERCULOSIS IN MILK.

BY BARTHEL AND STENSTRÖM.

THE authors' experiments were made with milk obtained from a cow the fore quarters of whose udder were tuberculous. The milk was clear like whey and contained a number of white clots; it was heated to the required temperature over a water-bath, the virulency being demonstrated by injecting 10 cc. into the peritoneum of a guinea-pig. Control experiments were made with cold milk.

In the first series of experiments on 4 guinea-pigs 3 of the control

animals died of tuberculosis in from 13 to 17 days, and a rabbit in 28, whereas those inoculated with heated milk did not die till much later.

A.—Milk treated	5 min. at 65° C.	Guinea-pig died in 67 days.	Tuberculous.
	10 ,,	,, destroyed 64 ,,	,,
	15 ,,	,, died in 68 ,,	,,
		Control rabbit died in 28 days.	
B.— ,,	5 ,, 70° C.	,, ,, 50 days.	Tuberculous.
	10 ,,	,, ,, 40 ,,	,,
	15 ,,	,, destroyed 90 ,,	,,
		Control guinea-pig died in 17 days.	
C.— ,,	5 ,, 75° C.	,, died in 1 day.	Killed accidentally.
	10 ,,	,, destroyed 79 ,,	Tuberculous.
	15 ,,	,, ,, 98 ,,	,,
		Control guinea-pig died in 17 days.	
D.— ,,	1 ,, 80° C.	,, destroyed 94 days.	Tuberculous.
	5 ,,	,, ,, 94 ,,	,,
	10 ,,	,, died in 75 ,,	,,
		Control guinea-pig died in 13 days.	

The authors took three samples of fresh milk 100 cc. each; one sample was neutralised by soda, the second acidified with sulphuric acid, and the third retained as a control. Twenty-five cc. of pus which was very rich in tubercle bacilli was diluted with 10 cc. of distilled water, and 10 cc. of this solution added to the samples, and all three kept for 10 minutes at a temperature of 70° cent. Guinea-pigs were inoculated into the peritoneum with 10 cc. and destroyed on the fifty-fourth day. The two inoculated with the neutral and acid samples were very tuberculous, the third slightly so. The same experiment was repeated with milk, in which the presence of Koch's bacillus was demonstrated. As before, three samples were used neutral, acid, and normal—and were exposed to various temperatures.

A.—	I.	Guinea-pig.	Killed 49th day.	Healthy.	Alkaline milk.	Heated 1 min. at 80° C.
	II.	,,	Died 36th ,,	Diseased.	Acid milk.	,, 1 ,, 80° C.
	III.	,,	,, 41st ,,	Healthy	Alkaline milk.	,, 5 ,, 80° C.
	IV.	,,	,, 46th ,,	Diseased.	Acid milk.	,, 5 ,, 80° C.
	A control guinea-pig died on the 27th day with generalised tuberculosis.					
B.—	I.	Guinea-pig.	Died 32nd day.	Healthy.	Alkaline milk.	Heated 1 sec. at 85° C.
	II.	,,	Killed 48th ,,	Diseased.	Acid milk.	,, 1 ,, 85° C.
	III.	,,	,, 32nd ,,	Healthy.	Alkaline milk.	,, 1 min. at 85° C.
	IV.	,,	Died 50th ,,	Diseased.	Acid milk.	,, 1 ,, 85° C.
	Three control guinea-pigs died on the 18th, 22nd, and 27th days.					
C.—	I.	Guinea-pig.	Killed 50th day.	Healthy.	Neutral milk.	Heated 5 min. at 80° C.
	II.	,,	Died 39th ,,	Diseased.	Alkaline milk.	,, 5 ,, 80° C.

These experiments show the influence coagulation has on sterilization, as the degree of alkalinity did not retard the death of the guinea-pigs, the bacilli remaining because they were enclosed in the clots. The exposure of milk to 80° cent. for one minute is sufficient, provided it does not coagulate, but in practice 1½ to 2 minutes is generally given.

(*Svensk Veterinärtidskrift.*)

PSEUDO-TUBERCULOSIS IN LAMBS.

BY BRIDRE.

THE curious disease of sheep due to the Preisz-Nocard bacillus is confined to adult animals, but the author describes a condition in lambs that strongly resembles it.

The symptoms vary according to the region attacked, the only constant one being increasing weakness, which appears a few days after birth. The disease is always fatal; the animal dies about the third week.

On *post-mortem* examination a number of abscesses are found in the different organs, especially in the liver and lungs.

In the pus from the abscesses, as well as in sections of the various organs, a very fine bacillus, which is smaller than the Preisz-Nocard, and from which it slightly differs, was isolated. It is both ærobic and anærobic, takes Gram's stain, and will not grow on gelatin, potatoes, or in bouillon. It will, however, grow on bouillon serum, coagulated serum, and serum gelose. It has slightly pathogenic properties with the guinea-pig and six months old lambs. A single drop of culture on the umbilicus of a newly-born lamb is fatal, reproducing the disease.

The disease is undoubtedly caused by contamination of the umbilicus.

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Books and Periodicals, &c., Received.

Farm and Home; The Agricultural Journal of the Cape of Good Hope; Returns of the Board of Agriculture; Returns of the Department of Agriculture for Ireland; Journal of the Royal Army Medical Corps; The Rhodesian Agricultural Journal; The Tropical Agriculturist of Ceylon; Moose Law Times; Modern Medicine; The Creamery Journal; Ceylon Agriculturist; London University Gazette; Recueil de Médécine Vétérinaire; Bulletin Vétérinaire.

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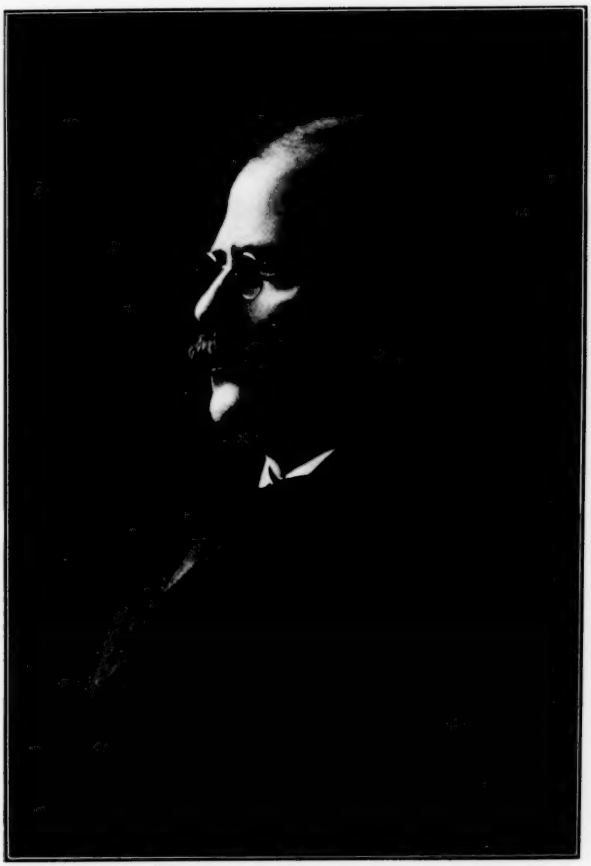

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